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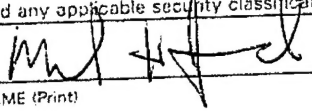
SIGNATURE 	DATE 26 Oct 01
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THE RELATIONSHIP OF INIDIVIDUAL DIFFERENCE AND GROUP PROCESS VARIABLES WITH SELF-MANAGED TEAM PERFORMANCE: A FIELD INVESTIGATION

Mark Harvey Jordan

A Dissertation

Submitted to

The Graduate Faculty of

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In Partial Fulfillment of the

Requirements for the

Degree of

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December 15, 2001

DISSERTATION ABSTRACT

THE RELATIONSHIP OF INIDIVIDUAL DIFFERENCE AND GROUP PROCESS VARIABLES WITH SELF-MANAGED TEAM PERFORMANCE: A FIELD INVESTIGATION

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Doctor of Philosophy, December 15, 2001
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Directed by Hubert S. Feild

The efficacy of dispositional individual difference team composition and group process variables in explaining team performance was examined for 1,030 military officers working in 92 teams over a 5-week period. The teams were assessed on both input variables (conscientiousness, extraversion, emotional stability, openness to experience, agreeableness, learning and performance goal orientation) and process variables (social cohesion and group potency). Team performance was measured with seven objective performance tasks (team leadership problem solving 1 and 2, computer simulation exercise, physical task exercise, and field operations performance 1, 2, and 3), and two subjective measures (team performance ratings and team member satisfaction). Of the input variables, only emotional stability and performance goal orientation showed

any predictive ability. Emotional stability predicted one of the objective criteria—computer simulation exercise. Moreover, performance goal orientation was negatively related to both team leadership problem solving 2 and field operations performance 1. Conscientiousness, extraversion, agreeableness, and learning goal orientation showed no relationship with hypothesized criteria. Of the group process variables, group potency exhibited the greatest predictive efficacy as it predicted unique variance in both subjective performance measures and 6 of the 7 objective performance measures over that of social cohesion. Social cohesion predicted unique variance in team member satisfaction over that of group potency. Additionally, social cohesion mediated the relationship between agreeableness and team member satisfaction. Implications, strengths, limitations, and directions for future study are discussed.

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On a personal note, I would like to dedicate this dissertation to my wife Theresa, my son Randy, and my daughter Katie, for their never ending support and love. Theresa spent many hours listening to my doubts, fears, and anxieties while always offering love, patience, kindness, and encouragement. Randy and Katie were always patient and quietly gave me confidence I was doing the right thing.

Finally, I would like to thank my Lord for sustaining me and guiding me through the Ph.D. and dissertation process. I know I could not have done it without Him watching over me and it is my hope that this dissertation honors Him.

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I. INTRODUCTION

Kurt Lewin is most often considered the father of group dynamics (Forsyth, 1990). Lewin's research in understanding groups, carried out to support the war effort in the 1940s, was aimed at investigating real-world problems and seeking to find answers that would lend practical significance in dealing with these problems (McGrath, 1984). The early findings of Lewin and others stimulated more research on teams in the following three decades. As team research increased, the focus shifted from research that sought to answer practical questions to a focus on theory-building and testing one theory of teams against another (Ilgen, Major, Hollenbeck, & Sego, 1993).

In the 1980s, work teams became the hot topic in the business and academic worlds. Ilgen et al. (1993) attributed this focus on teams to three important factors: (a) competitive economic concerns based on increased competition from countries that are increasingly utilizing teams, (b) advances in communications technology because of the extensive use of new technologies such as audio and video teleconferencing and the extensive use of electronic mail, and (c) team failures such as highly publicized military disasters that highlighted faulty team processes. The current emphasis on teams stems from trying to understand the role and effectiveness of teams in the workplace. More

specifically, concern centers on the ability of employees to perform effectively in team environments (Ilgen et al., 1993).

More organizations are enthusiastically incorporating teams and team-based structures. In fact, some researchers estimate that in the next several years, as much as 40 to 50% of the United States workforce will be working in some form of self-managing or empowered team (Stewart, Manz, & Sims, 1999). This team focus is intended to improve organizations' productivity, quality, and customer service to eventually affect the bottom line (Guzzo & Salas, 1995).

Much of the literature does not make a distinction between teams and groups. For instance, the psychological literature tends to focus on "groups," whereas other literature highlights "teams." Most of the literature on small groups characterize groups as having four attributes: (a) two or more persons, (b) some form of interaction between the persons, (c) the persons are interdependent in some way, and (d) there is a time element involved (McGrath, 1984). An additional and defining characteristic that differentiates a team from a group is what Ilgen et al. (1993) described as the collective's goals and objectives and the fact that the members on the team share the goals and objectives. These five characteristics, then, are what define a team and are the characteristics the current study uses to distinguish a team.

The trend in organizations towards employing different types of teams, such as self-managing teams, virtual teams, quality circles, customer service teams, autonomous work groups, and self-directed teams to accomplish organizational goals and objectives becomes important when one considers that team-based activity might be the

determining factor in the success or failure of a project, division, department, or even a business. While growth in the use of team-based activities in organizations has increased at a phenomenal rate, research on teams has lagged behind (Guzzo & Salas, 1995). Ilgen et al. (1993) have suggested more research is needed in the coming years on self-managing (autonomous, quasi-independent) work teams.

Self-managing teams are characterized by increased autonomy leading to more control over day-to-day work activities of the team, decision-making, and behavioral control for team members (Neck, Connerly, & Manz, 1997; Wall, Kemp, Jackson, & Clegg, 1986). Additionally, Neck et al. (1997) suggested that these teams take responsibility for traditional management functions such as task assignment, dealing with quality issues, and interpersonal problems that arise among team members. Teams that participated in the current study met the five characteristics Ilgen et al. (1993) used to describe a team, and were classified as self-managing or semi-autonomous teams.

Focus of the Present Investigation

Teams are made up of individuals that each bring certain characteristics into the team environment which affect the ultimate success or failure of the team. Team composition—the mixture of individual difference characteristics (e.g., skills, abilities, attitudes, dispositions) included in a team—is critical to the success or failure of a team (Stewart et al., 1999). Research on the relationship between team composition (individual differences) aggregated to the team level and team effectiveness has been lacking in the literature. Especially absent is the study of non-demographic team composition variables and their association with team performance in a field setting

(Barrick, Stewart, Neubert, & Mount, 1998; Barry & Stewart, 1997; Lonergan, Long, Bolin, & Neuman, 2000). Non-demographic team composition variables (e.g., personality and dispositions) and their relationship with both team processes and team effectiveness have been highlighted as an area needing research attention, thus making team composition a ripe area for investigation (Barrick et al., 1998). To help fill this void, several researchers have begun to study the relationship between both individual difference team composition variables and team processes variables and team effectiveness (Barrick et al., 1998; Barry & Stewart, 1997; Lonergan et al., 2000; Neuman, Wagner, & Christiansen, 1999).

The current study attempts to address the shortfall of research identified by Barrick et al. (1998) above. The research objective for the current study was to investigate the relationship between both team composition (individual difference) and team process variables and team effectiveness using the input-process-outcome (I-P-O) framework, initially developed by McGrath (1964) and later modified and used by Hackman (1987, 1990), as a guide.

Overview of the Model

In developing the model for the current study, a general framework (see Figure 1) was used to organize and categorize the variables being studied. This framework, the Input-Process-Outcome (I-P-O) framework, was developed by McGrath (1964) and subsequently modified by others in the organizational behavior literature (e.g., Gladstein, 1984; Hackman, 1987; McGrath, 1984). Much of the current research on teams adopts the I-P-O framework (Barrick et al., 1998; Tesluk & Gerstner, 2000).

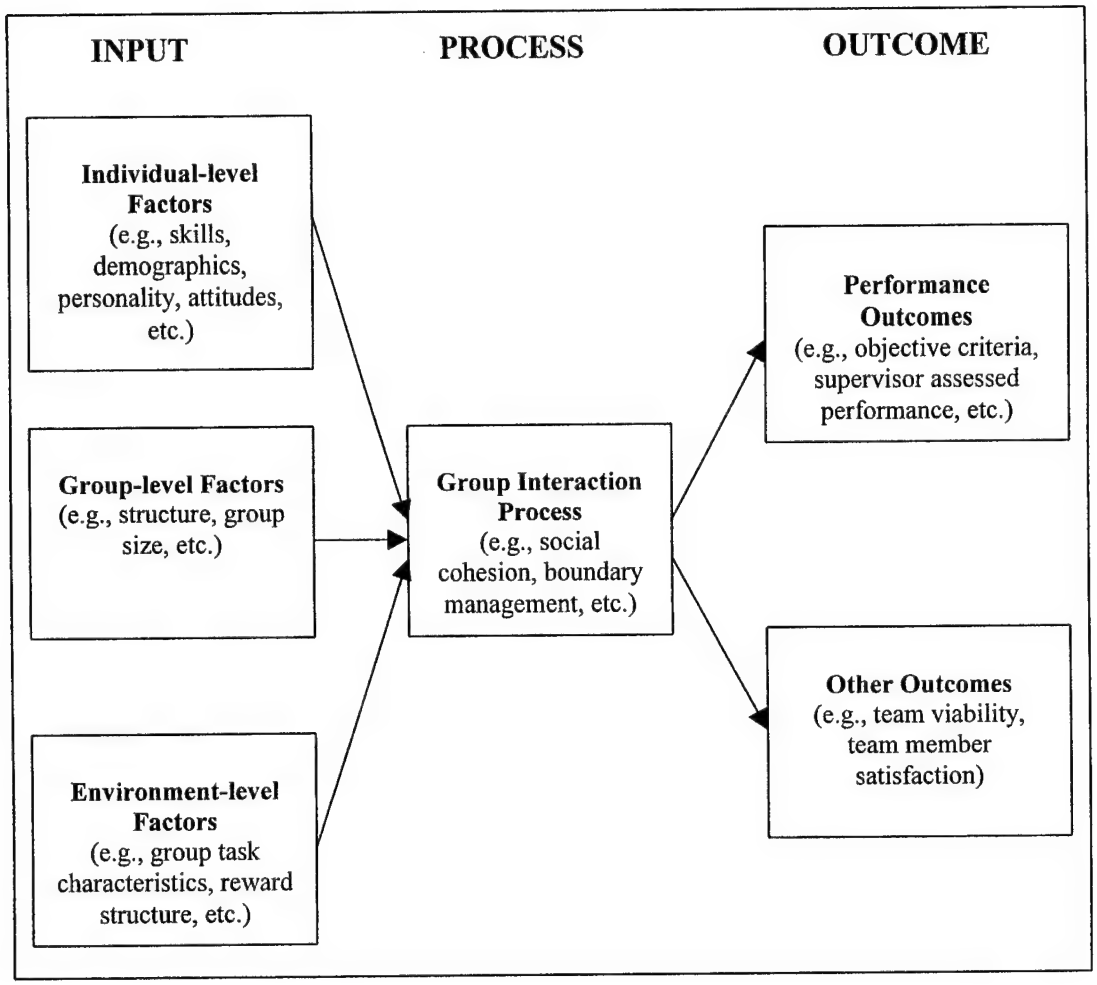


Figure 1. Team Input-Process-Outcome framework based on Hackman (1987, p. 316).

The framework posits that team members come into the team situation with a certain set of input factors that represent the team's potential for performance. The input factors are traditionally divided into three categories or levels: (a) individual-level factors (e.g., individual differences—personality, knowledge, skills, and abilities), (b) group-level factors (e.g., team size, structure), and (c) environmental-level factors (e.g., reward structure). Hackman (1987) pointed out that much of the research using the I-P-O framework follows the assumption that process mediates the relationship between input variables and outcomes. However, he argued that this might not always be the case. For instance, input and outcome can be related without the mediating role of the group process. The process portion of the I-P-O framework includes interaction variables, such as communication structures, team-member exchange, and social cohesion, that represent interactions among team members. Finally, Hackman noted that researchers investigating team effectiveness (outcomes) in an artificial environment have tended to develop success criteria in which it was easy to determine success or failure. Because most teams in organizations are not structured like teams in laboratory and research settings and teams are together for longer periods of time, effectiveness criteria for teams in organizations tend to be more complex. For this reason, team effectiveness has been described as having three components: (a) team performance (this includes objective team performance criteria and subjective assessments), (b) the viability of the team to continue in the future (group members' behavior may affect relationships among team members), and (c) team member satisfaction (if members of the group reacted to the experience negatively, then the costs of performing the task

successfully at the expense of team member satisfaction was probably too high) (Hackman, 1987; Hackman & Morris, 1975). The latter two components, team viability and team member satisfaction, are represented in Figure 1 as "other outcomes."

The current study examines two major areas of the I-P-O framework. First, individual level factors, specifically individual difference team composition variables of the model were investigated. Expanding on Barrick et al. (1998), the current study investigates how both personality and goal orientation, as individual difference team composition variables, relate to team effectiveness. Second, the current study examines two group process variables (group potency and social cohesion) and their relationship to team effectiveness.

Aggregation Issues

Task type. The success of predicting team success on a task depends substantially on the type of team task that is being carried out by the team. Failure to account for the type of task being performed can lead to inaccurate or misleading findings (Hackman, 1987). Several different task typologies have been proposed in the team literature. Two of the most common are Driskell, Hogan, and Salas' (1988) and Steiner's (1972) typologies.

Driskell et al. (1988) introduced a task typology modified from early work done on task types by Carter, Haythorn, and Howell (1950), Holland (1966), McCormick, Finn, and Scheips (1957), and McGrath (1984). This task typology relies on the assumption that different behaviors and activities are required to complete different types of tasks. The tasks in the Driskell et al. (1988) typology are classified into one of

six categories: (a) mechanical/technical (construction, operation, maintenance of things), (b) intellectual/analytic (generation, exploration, or verification of knowledge), (c) imaginative/aesthetic (invention, arrangement, or production of expressive products), (d) social (training, assisting, or serving others), (e) manipulative/persuasive (organization, motivation, or persuasion of others), and (f) logical/precision (performance of explicit, routine tasks or tasks requiring attention to detail). Using this typology in a meta-analysis conducted by Lonergan et al. (2000), some support was found for the moderating effects of task type on the relationship between personality and group/team performance.

Steiner (1972) developed a task typology that determines how team members contribute to the group task. In his typology, members can contribute to task completion in one of four ways: (a) disjunctive tasks (the solution or product of one member is the solution selected and all others are rejected—if one member performs well, the whole team performs well), (b) conjunctive tasks (each team member performs the same function and the least proficient member determines the team's success—a team is only as strong as its weakest link), (c) additive tasks (each team member's contribution is added together to determine the team's success on the task), and (d) discretionary tasks (each team member's output/contribution is combined in any manner the team chooses). Both task typologies offer viable ways for operationalizing team personality and individual difference team composition variables (Barrick et al., 1998; Lonergan et al., 2000). Current research (e.g., Barrick et al., 1998; LePine, Hollenbeck, Ilgen, & Hedlund, 1997; Neuman & Wright, 1999) investigating the relationship

between individual difference variables aggregated to the team level and performance has adopted Steiner's (1972) task typology to operationalize the team composition variables. Thus, the current study also uses a modification of Steiner's (1972) task typology to operationalize team composition variables.

Operationalization. There is currently no universally accepted way of measuring the personality of a team (Lonergan et al., 2000). However, one method that is commonly used is aggregating individual team member responses to the group level. Aggregating individual responses to the group level, however, requires the researcher to follow some basic guidelines such as using an appropriate theoretical rationale and empirically demonstrating within-group agreement to ensure the individual-level scores reflect team-level attributes (Schneider & Bowen, 1985; Tesluk, Mathieu, Zaccaro, & Marks, 1997). Using Barrick et al.'s (1998) modified typology based on Steiner's (1972) task typology, three operationalizations for empirically representing team composition emerge. First, for additive tasks in which more of a characteristic on a team is better, calculating the mean score for individual measures is most appropriate. Second, for disjunctive or conjunctive tasks in which the highest or lowest performing individual on the team receives total weight in determining the success or failure of the team, calculating the minimum score (conjunctive) or maximum score (disjunctive) is the most appropriate aggregation method (Steiner, 1972). Finally, the variance method is used when the task is compensatory (individual inputs are averaged to arrive at a team outcome). Variance is useful when trying to understand "the effect of group-level traits on compensatory tasks that benefit from diverse inputs" (Barrick et al., 1998, p.

379). In summary, the type of task being performed by the team, in large part, determines how to aggregate the data, although Barrick et al. argued that the type of operationalization also depends on the variable being studied.

In the current study, all of the teams were composed of military members with similar military tenure and age. The tasks required of each of the teams relied on input and participation from each team member for maximum chance of success on the tasks. The tasks were a combination of planning and problem-solving processes and physical tasks that focused on team member input and participation to give that team the best chance for success on the task at hand. Emphasis was placed on soliciting and factoring all inputs into the planning process and solution. Thus, the summative inputs and participation from each team member in the planning and execution processes were equally important (additive) for the chance of success on the task. Based on Steiner's (1972) task typology, then, the mean method of aggregating individual responses to the team level was used (with two exceptions that will be discussed in a later section).

Team Effectiveness

In order to assess whether or not a team has been effective in its outcomes, there must be some way to measure the team's effectiveness. Several definitions of team effectiveness have emerged in the team literature. Some researchers have defined effectiveness in terms of tangible outcomes of the team's efforts (Levine & Moreland, 1990). Steiner (1972), on the other hand, viewed effectiveness as potential productivity plus any losses due to a faulty process. This model of effectiveness did not identify specific characteristics of effectiveness. In Shea and Guzzo's (1987) study, they

defined effectiveness in terms of whether or not the team met its goals, objectives, or charter (as reported by Guzzo, 1986). If the team set a goal of accomplishing a certain task in a specified period of time, then effectiveness would be determined by whether or not the team accomplished the task in the specified period of time. The team effectiveness definition that has been most widely accepted is the one put forward by Hackman (1987, 1990) that delineates three criteria of team effectiveness. Hackman's first criterion of team effectiveness is the group's productive output (a product, service, or decision produced by the team). The quality, timeliness, or quantity of the output is not judged by the team, however, but by the client or customer that is receiving the output. Hackman argued that the team might consider team output as excellent, but if the client or customer does not consider the output acceptable, then the team cannot be considered effective. Guzzo (1986) argued that because objective performance measures rarely exist in organizations, teams tend to rely more heavily on others' assessments of their productive output than objective measures.

The second team effectiveness criterion Hackman (1987, 1990) proposed was the capacity of the team to continue to function interdependently as team members in the future. He argued that a team that behaves in a certain way in accomplishing its objectives, so as to alienate other team members, would not have the capacity to continue working together in the future. In other words, the cost of producing an output is loss of members willing to work interdependently with others on the team. The final criterion that Hackman discussed was whether the team experience contributed to the well-being of the members of the team. Like the second criterion, the cost of frustrated

and disillusioned team members at the expense of the an effective productivity output might be too high for the team to be considered effective. In the current study, measures of all three criteria that Hackman identified were collected.

Theoretical Model and Hypotheses

Using the basic I-P-O (Figure 1, p. 5) as a framework, the theoretical model for the current study (see Figure 2, p. 13) was developed. The model illustrates the hypothesized relationships between both individual difference team composition variables and team process variables and team effectiveness variables. The I-P-O framework in Figure 1 subdivides the input portion of the framework into three factors (Hackman, 1987). The first factor (individual-level factors) discusses those things that individuals bring to the team (e.g., individual difference team composition variables—the principal focus of the current study). The second factor (group-level factors) describes things the team brings to the process (e.g., team size, structure, etc.), and the third factor (environmental-level factors) in the input portion of the I-P-O framework describes environmental variables that the team must work within (e.g., group task characteristics, reward structure, etc.).

The current study investigates two portions of the I-P-O framework: (a) the individual-level factors that are commonly referred to as team composition variables—specifically, the relationship between team composition factors (e.g., personality and goal orientation) and team outcomes and (b) two process variables (group potency and social cohesion) and their relationship to team outcomes (Figure 2). The specific

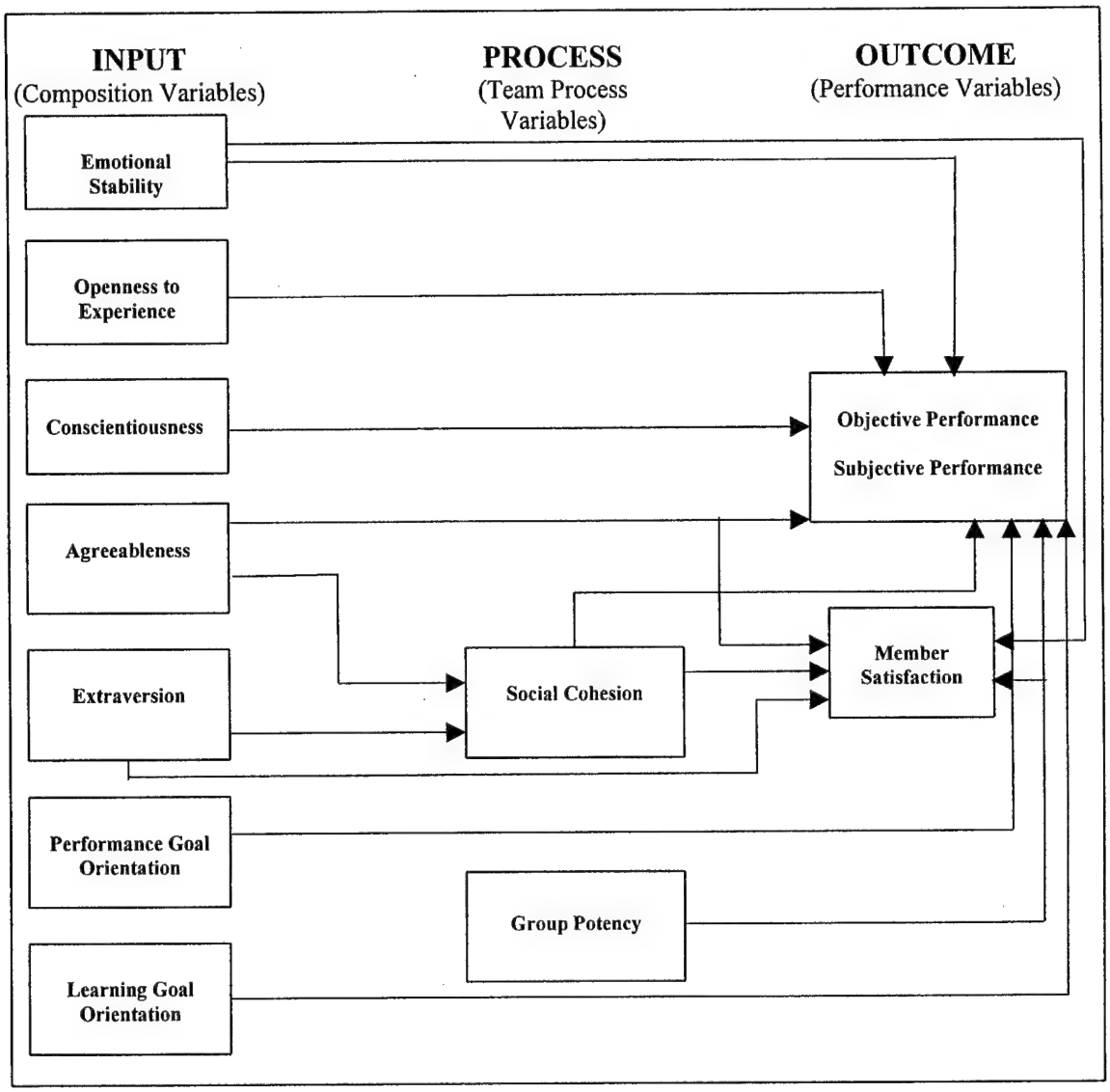


Figure 2. Conceptual model using the Input-Process-Output framework highlighting variable relationships to be tested.

theoretical rationale and hypotheses for each of the relationships depicted in the model are developed in the following sections.

Input Variables: Team Composition—Individual Differences

The theoretical importance of team composition as an influence on team processes and effectiveness has been argued for many years (Haythorn, 1953; Steiner, 1972). Recently, research has focused on dispositional attributes, specifically personality dimensions, of individuals on teams as resources that can influence team effectiveness (Barrick et al., 1998; Barry & Stewart, 1997; Lonergan et al., 2000). However, aggregation of these attributes is necessary to account for these attributes (LePine et al., 1997) at the team level. Since individuals make up teams and these individuals interact in a team environment, the demographic characteristics, abilities, and dispositions that members possess play a critical role in the success of the team accomplishing its goals and objectives (Morgan & Lassiter, 1992). Individual differences in team composition have been considered along several dimensions, to include demographics (McGrath & Altman, 1966), general mental ability (Tziner & Eden, 1985), and dispositions (Driskell et al., 1987). The research on the first two of these individual difference variables (demographics and ability) are well established. The research on dispositions as individual difference variables is not as well established. Consequently, the current study investigats personality and goal orientation (both dispositions) as individual difference team composition variables.

Demographics

Biographical or demographic data are one area of individual differences that have been shown to be related to team performance (Morgan & Lassiter, 1992). Many studies have highlighted that group performance is related to demographic variables such as age (McGrath & Altman, 1966; Simmons, Pelled, & Smith, 1999), gender (Exline, Gray, & Schuette, 1965; Fenelon & Megargee, 1971; Shaw, 1976), tenure (Ancona & Caldwell, 1992), and experience, education and tenure (Smith, Smith, Olian, & Sims, 1994). A more recent study by Baugh and Graen (1997), using 31 cross-functional teams in a medium-sized state agency, found that teams that varied based on gender and racial composition rated their teams as less effective than those teams that were homogeneous. Baugh and Graen went on to say that perceptions of decreased effectiveness were only present in the racially mixed groups and not the gender mixed groups. Research on the relationship between demographics as a team composition variable and team outcomes continues to be a topic area of interest to organizational behavior researchers.

General Mental Ability

Another individual difference team composition variable associated with team performance is general mental (or cognitive) ability (Morgan & Lassiter, 1992). Two meta-analyses (Hunter & Hunter, 1984; Pearlman, Schmidt, & Hunter, 1980) have concluded that cognitive ability is a predictor of individual job performance. In the context of teams, recent studies have examined the relationship between general mental ability and team performance. For instance, Barrick et al. (1998) found that teams with

a higher mean level of general cognitive ability performed better than teams with lower mean levels of general cognitive ability. Finally, a major study exploring general mental ability in cooperative tasks was that of Tziner and Eden (1985) in which they examined the effect of general mental ability on members of three-man tank crews by varying crew composition with respect to both ability and motivation. Their study was significant because they used active military crews performing highly interdependent tasks, and all possible combinations of individual ability levels and motivation were employed. Their results showed that both individual mental ability and motivation had significant effects on team performance. Moreover, their study also showed that each team member's ability "influenced crew performance effectiveness differently depending on the ability levels of the other two members" (p. 91). Members with high ability achieved more when in combination with other high ability members than with low ability members. Additionally, those teams with all high mental ability individuals far exceeded performance expectations.

Personality

In the past 10 years, there has been widespread acceptance of a five-factor structure (Big Five) of personality, although there are slight disagreements on the exact definitions of the dimensions (Barrick & Mount, 1991; Tett, Jackson, & Rothstein, 1991). There is, however, much in common in the traits that define each of the dimensions (Barrick & Mount, 1991). The Big Five personality factors that have been identified and used by most organization researchers are (a) extraversion (being sociable, gregarious, assertive, talkative, and active), (b) emotional stability (being

secure, stable, relaxed, self-sufficient, not anxious, and tolerant of stress), (c) agreeableness (being courteous, flexible, trusting, good-natured, cooperative, forgiving, soft-hearted, and tolerant), (d) conscientiousness (being careful, thorough, responsible, organized, planful, hardworking, achievement-oriented, and persevering), and (e) openness to experience (being imaginative, cultured, curious, original, broad-minded, intelligent, and artistically sensitive) (Barrick & Mount, 1991).

However, there is some disagreement as to the number of personality factors that make up a complete taxonomy. For instance, Hough (1992) has argued that five factors are not sufficient to predict performance and instead were only adequate as a descriptor of performance. She believed that the Big Five were too heterogeneous and were by themselves, incomplete. She proposed a nine-factor structure. Others also have not been convinced that the Big Five is the appropriate personality dimension taxonomy, such as Hogan (1986) who introduced a six-factor taxonomy, and Eysenck (1991, 1992), who proposed a three-factor taxonomy. Because of the widespread acceptance of the Big Five personality dimensions (Mount, Barrick, & Stewart, 1998), this investigation adopted the McCrae and Costa (1985, 1987) five-factor taxonomy.

Researchers have extolled the importance of personality factors as potential predictors of group performance. For instance, Cattell (1951) argued that personality characteristics in certain instances should enable one to predict group performance. The literature for many years, however, has been mixed on the relationship between personality characteristics and team performance. Some researchers claim that the personality characteristics of team members have significant impact on team

performance (Cattell, 1951; Haythorn, 1968; Helmreich, 1987; Ridgeway, 1983). On the other hand, other researchers have not found personality to be a good predictor of team performance (Haythorn, 1953; Kahan, Webb, Shavelson, & Stolzenberg, 1985).

Driskell et al. (1988) attributed the lack of consensus over the issue of whether personality characteristics relate to team performance to three primary factors: (a) much of the research has emphasized personality in terms of psychiatry and clinical psychology focusing on detecting psychopathology, (b) until recently, there has been little consensus on how personality should be defined and measured—this has led to a plethora of personality characteristics and researchers using different names for the same personality characteristic, and (c) early research has tended to ignore the role of the type of task being performed in determining the team performance.

Goldberg (1992) argued that the Big Five was never intended to be an all-inclusive catalog for all personality traits that exist but to be used as a framework in which to organize the different individual differences that exist in people. In the past decade, there has been debate about the appropriateness of the Big Five to encompass the theoretical dimensions of personality. Some have argued that the number of times the Big Five have been reproduced, with different methods, researchers, and instruments across many different samples make it a robust way to explain personality (Costa & McCrae, 1995). Furthermore, Digman (1990) pointed out that Costa and McCrae, using the NEO-PI as markers for the Big Five, have demonstrated the presence of the five-factor model in many of the widely known personality inventories. These include the Eysenck Personality Inventory, the Jackson Personality Research Form, the

Myers-Briggs Type Indicator, and the California Q-Set. In addition, using the NEO-PI as markers for the Big Five has revealed the presence of four of the five dimensions in the Minnesota Multiphasic Personality Inventory. Salgado (1997) summarized the advantages of using the Big Five in work-related situations with three important points: (a) it is a simple taxonomy to use, (b) it is a good framework for incorporating the results of many studies to examine the relationships between personality and work behaviors, and (c) it advances our understanding of job performance by offering some personality dimensions that relate to occupations and job performance criteria. Finally, Digman (1990) summarized the utility of the Big Five best when he stated "At a minimum, research on the five-factor model has given us a useful set of very broad dimensions that characterize individual differences. These dimensions can be measured with high reliability and impressive validity. Taken together, they provide a good answer to the question of personality structure" (p. 436).

Previous research has shown that individual-level characteristics, aggregated to the team level, can predict team performance. This research has focused on demographic characteristics (Exline et al., 1965; Fenelon & Megargee, 1971; McGrath & Altman, 1966; Shaw, 1976; Simons et al., 1999), general mental ability (Hunter & Hunter, 1984; Pearlman et al., 1980), and personality (Barrick et al., 1998; Barry & Stewart, 1997; LePine et al., 1997; Lonergan et al., 2000; Neuman et al., 1999; Neuman & Wright, 1999) aggregated to the team level. The current study examines conscientiousness, extraversion, agreeableness, emotional stability, and openness to experience (as well as goal orientation) in the context of teams and team performance.

The theoretical background discussing these personality dimensions and their relationship to performance is presented below. This discussion is followed by a review of team-level studies investigating the relationship between these personality dimensions and team performance. Finally, specific hypotheses related to both team process and team effectiveness criteria are proposed.

Conscientiousness. Conscientiousness has been found to be one of the most robust of the Big Five personality dimensions. However, there has been some disagreement as to the exact nature of conscientiousness as a personality dimension. Barrick and Mount (1991) pointed out that some researchers have argued that conscientiousness reflects dependability (planful, organized, thorough, responsible, being careful) while others posit conscientiousness also includes volitional characteristics (hardworking, achievement-oriented, and persevering). The current study adopts the position that many have taken (Barrick & Mount, 1991; Barrick, Mount, & Strauss, 1993; Costa & McCrae, 1992; Digman, 1990) that conscientiousness includes both characteristics—dependability and volitional aspects.

Conscientiousness has been studied in the context of many varied relationships. Research has shown it to be negatively related to employee absence (Judge, Martocchio, & Thoresen, 1997) and positively related to success in screening interviews (Caldwell & Burger, 1998), extrinsic and intrinsic career success (Judge, Higgins, Thoresen, & Barrick, 1999), decision making in a change context (LePine, Colquitt, & Erez, 2000), and employee training success (Martocchio & Judge, 1997). Probably the most studied relationship with conscientiousness has been with job performance. In four separate

meta-analyses over the past decade, conscientiousness has been found to be related to individual-level job performance across most occupations (Barrick & Mount, 1991; Hurtz & Donovan, 2000; Salgado, 1997; Tett et al., 1991). Of the Big Five personality dimensions, conscientiousness has been found to be the most consistent predictor of job performance (Barrick & Mount, 1991). In their meta-analysis, Barrick and Mount (1991) investigated the relationships between the Big Five personality traits and job performance across five different occupational groups (professionals, police, managers, sales, and skilled/semi-skilled) with three job performance criteria (job proficiency, training proficiency, and personnel data). They proposed that conscientiousness would predict all three job performance criteria across all of the occupational groups. Their review of research on 162 samples from 117 studies (N = 23,994) revealed that conscientiousness was a valid predictor for every occupational group (ρ ranging from .20 to .23) studied and for all criterion types (ρ ranging from .20 to .23). Hurtz and Donovan (2000), in a meta-analysis of 26 studies, concluded that conscientiousness results were consistent with Barrick and Mount's (1991) study.

Finally, two recent investigations also revealed conscientiousness as a predictor of job performance. First, Hirschfeld (1996) found a positive relationship between conscientiousness and both overall job performance (rated by supervisors) and self-rated performance in a sample of 180 full-time employees of a Fortune 200 financial services corporation. Second, Stewart (1999), reported conscientiousness showed a consistent relationship with job performance for employees in both a transition stage (newly hired) and a maintenance stage (veteran employees).

Extraversion. It has been widely accepted that the extraversion dimension of the Big Five is what Eysenck (1953) referred to as extraversion (Barrick & Mount, 1991). This dimension has received interest for many years. In research including studies from 1900 to 1957, using factor analytic techniques, Mann (1959) labeled extraversion as one of seven personality dimensions that emerged from the myriad of studies he examined. Traits most frequently identified with extraversion are being sociable, gregarious, adventurous, energetic, assertive, talkative, and active (Barrick & Mount, 1991). Research has shown extraversion to be related to a variety of factors, including popularity (Mann, 1959), perceptions of self (Barrett & Pietromonaco, 1997), decision making (Bonner, 2000), absenteeism (Judge et al., 1997), and expatriates' desire to terminate an assignment (Caliguiri, 2000) among others. Although all individuals must interact with others in most work environments, no matter their personality, extraversion is a personality dimension that has been hypothesized to be important in jobs where interaction is necessary (Salgado, 1997). Several studies bear this out. First, in a meta-analysis of 11 studies (N = 1,586), Mount et al. (1998) investigated the predictive ability of the Big Five personality dimensions in two different work settings. The first type of work setting was a dyadic relationship where an employee had direct interaction with a customer or client. The second type of work setting was jobs requiring teamwork (employees interacting interdependently with other employees). Their results revealed that extraversion had a true mean correlation of .22 for jobs requiring teamwork and a true mean correlation of .07 for dyadic jobs. The overall true mean correlation for all jobs was .14. It must be noted that the sample size for this

meta-analysis was only 11 studies, and when the studies were divided into the types of jobs, the sample size was even smaller (teamwork jobs, $\underline{N} = 4$; dyadic jobs, $\underline{N} = 6$).

Although the Mount et al. (1998) study consisted of a small sample size, the results confirmed the findings of another meta-analysis (Salgado, 1997). In Salgado's study, he found that extraversion showed a positive correlation with performance in two occupations (police and managers)—both where interaction with others is likely to be meaningful.

Agreeableness. Another Big Five personality dimension that should be predictive of group performance in a job where interaction is prevalent is agreeableness. Agreeableness, sometimes labeled as likability, friendliness, social conformity, and compliance, is associated with traits such as being courteous, flexible, trusting, good-natured, cooperative, forgiving, soft-hearted, and tolerant (Barrick & Mount, 1991). The disagreeable person is critical, faultfinding, touchy, defensive, alienated, and contrary (Hough, 1992).

Agreeableness has been found to be related to many different variables in the literature. For example, it was found to be negatively related to expatriates' desire to terminate an assignment (Caligiuri, 2000), creativity (Hough, 1992), positively related to high self esteem (Barrett & Pietromonaco, 1997), and effort (Hough, 1992). Additionally, agreeableness has been found to predict job performance in certain types of jobs that require interaction and interpersonal relations. For instance, Stewart and Carson (1995) reported that agreeableness and extraversion were related to overall performance measures of customer service employees. In a meta-analysis of studies

from the European Community, Salgado (1997) found that agreeableness was a valid predictor of training proficiency. Salgado's finding supports Barrick and Mount's (1991) meta-analysis that noted a moderate estimated true correlation between agreeableness and training proficiency. Finally, Mount et al. (1998) performed a meta-analysis of 11 studies that looked at two types of interaction-based jobs. The first type was teamwork-based jobs in which employees had to interact with one another to perform their jobs. The second type was dyadic-based jobs in which employees only interacted with either customers or clients. They concluded that in teamwork-based jobs, agreeableness was a much better predictor of overall job performance than in dyadic-based jobs (.33 vs. .13 true estimated mean correlation).

Each of the previous studies confirmed that the Big Five personality dimension of agreeableness shows higher relationships in jobs where interaction and interpersonal relations are important. Although several of the previous studies have limitations, the similar findings in each makes a stronger case for the validity of the relationships cited.

Personality at the Team Level

As stated earlier, studies of non-demographic, team-composition characteristics as related to team processes and team effectiveness have been lacking in the team literature. To take this one step further, Barrick et al. (1998) argued that there has been a lack of research regarding the relationship between individual difference characteristics and team effectiveness in field settings. The current study attempts to fill this void in several ways. First, this research will extend the Barrick et al. (1998) study by investigating the relationship between individual difference (Big Five personality

dimensions) team composition variables and team effectiveness involving tasks that more closely simulate tasks in a field setting. Second, the current study extends the Barrick et al. study by using objective and subjective measures of performance, including team member satisfaction and team viability. Thus, all three of the characteristics of team effectiveness forwarded by Hackman (1987) are measured. Third, the current study extends the literature by investigating the relationship between a relatively new dispositional individual difference variable, goal orientation (aggregated to the team level), and team effectiveness. Finally, the current study examines the relationship between group potency as a team process variable and team effectiveness. Goal orientation and group potency are discussed in more detail in later sections.

Empirical Studies on Team Personality—Team Effectiveness Relationship

While the research to date on individual differences within teams (team composition) has been limited, the number of studies in this area is increasing (see Table 1). Three current studies are summarized below. Each of the following studies investigated the relationship between one or more of the Big Five personality dimensions and team effectiveness. These studies were selected for review because they each used team-based samples in an organizational field setting. The other studies, while interesting, used undergraduate and graduate students as their sample, and the studies were performed in a laboratory setting.

Table 1

Summary of Team Composition (Individual Differences)—Team Effectiveness Studies

Author(s)	Participants	Number of Participants and Teams	Criteria Measures Used	Personality Dimensions Found Significant	Findings
Barry and Stewart (1997)	Graduate students	289 61 teams	Instructor rating of problem solving success	Extraversion	Level of extraversion in teams was curvilinearly related to task focus and team performance.
LePine, Hollenbeck, Ilgen, and Hedlund (1997)	Undergrad-uate students	204 51 teams	Accuracy of teams' decisions	Conscientiousness	When leader and staff were high on both cognitive ability and conscientiousness, decision accuracy was high.
Barrick, Stewart, Neubert, and Mount (1998)	Employees	652 51 teams	Supervisor ratings and team viability	Extraversion Conscientiousness Emotional stability	Conscientiousness (mean & variance), extraversion (minimum) and agreeableness (mean) were related to team performance. Also, extraversion (mean & variance) was related to team viability. Cohesion mediated relationship between extraversion (mean) and team viability.
Neuman and Wright (1999)	Employees	316 79 teams	Supervisor ratings, work completed, and work accuracy	Agreeableness Conscientiousness	Conscientiousness explained unique variance in task performance and work accuracy. Agreeableness explained unique variance in task performance and work completed.
Neuman, Wagner, and Christiansen (1999)	Employees	328 82 teams	Human resource personnel ratings and supervisor ratings	Agreeableness Conscientiousness Emotional stability Extraversion Openness to Experience	Personality (overall) predicted 29% of variance in team performance. Using team personality diversity, emotional stability and extraversion explained significant variance in team performance. Using team personality elevation (mean), conscientiousness, agreeableness, and openness to experience explained significant variance in team performance.
Lonergan, Long, Bolin, and Neuman (2000)	Meta-analysis	33 studies	Various	All of the Big Five were significant to some degree	The Big Five personality dimensions were related to team performance in various types of tasks.

Neuman et al. (1999), using retail assistants (n = 328) divided into 82 work teams, investigated the relationship between the Big Five personality dimensions and ratings of team performance. Neuman et al. used two different aspects of personality composition to characterize the Big Five personality dimensions at the team level. First, they used team personality elevation (TPE) to indicate the mean level of a certain personality dimension. So, if a team had a high TPE rating on conscientiousness, it would indicate that the team as a whole was planful, organized, thorough, responsible, careful, hardworking, achievement-oriented, and persevering. Second, Neuman et al. used team personality diversity (TPD), the variance in team members' scores for a particular personality dimension. A team with high TPD was considered to be heterogeneous, and a team low in TPD was homogeneous. Another important aspect of the Neuman et al. study was their consideration of task type in determining which personality dimensions would predict performance. Neuman et al. used the task typology framework proposed by Driskell et al. (1988) to predict the personality-performance relationship.

Using regression analysis, Neuman et al. (1999) found that the composites of the Big Five personality dimensions of both TPE and TPD predicted 29% of the variance in team performance, suggesting that across all dimensions, both TPE and TPD explained unique variance in team performance. Taking the regression one step further, Neuman et al. (1999) found that each personality dimension, operationalized as either TPE or TPD, predicted significant variance in team performance (8% to 18%). In this analysis,they found that TPD of emotional stability and extraversion explained

significant variance in team performance, and TPE of conscientiousness, agreeableness, and openness to experience explained significant variance in team performance. Their research suggested that teams that were more diverse with respect to extraversion and emotional stability performed at a higher level. Additionally, teams with more team members high in conscientiousness, agreeableness, and openness to experience performed at a higher level. Although this research extended the literature on personality composition of teams, it must be noted that the team performance data used were not objective data. Customer service and task completion were rated by both supervisors and human resource personnel. The Neuman et al. study also did not measure the other two aspects of team effectiveness as described by Hackman (1987, 1990), the capacity to remain together as a team and satisfaction of team members.

Neuman and Wright (1999), using 316 human resource personnel in 79, 4-person teams, investigated the relationship between the personality dimensions of conscientiousness and agreeableness aggregated to the team level and subjective and objective measures of team performance. Neuman and Wright employed the task-type typology introduced by Steiner (1972) to determine the aggregation technique used in their study. The researchers considered the tasks in this study to be conjunctive because "each team member had unique skills that were not readily transferable to other team members" (p. 377). As a result, if one team member failed, the whole team failed. Neuman and Wright employed three different measures of team performance—supervisor ratings of overall team performance, work accuracy, and work completed.

Results of their study revealed that personality dimensions explained unique variance beyond team member skills and cognitive ability in each of the performance criteria. Specifically, they found that conscientiousness explained unique variance beyond skills and cognitive ability in task performance and work accuracy. In addition, agreeableness explained unique variance in task performance and work completed. The Neuman and Wright study, as was the case with the Neuman et al. study, did not measure Hackman's (1987, 1990) team effectiveness aspects of team viability or team member satisfaction. Neuman and Wright concluded by suggesting that personality variables should be considered when investigating team effectiveness.

Barrick et al. (1998), using 51 work teams (n = 652), examined the relationship between individual difference team composition variables of the Big Five personality dimensions and both team processes and team outcomes using the I-P-O framework (Hackman, 1987; McGrath, 1984). Barrick et al. used Steiner's (1972) task typology to operationalize the measurement of personality composition variables studied. The team process variable they studied was social cohesion. The team effectiveness measures used were an overall supervisor assessment of team performance and a supervisor assessment of team viability. Thus, Barrick et al.'s study comes closer than the previous two in measuring Hackman's conceptualization of team effectiveness.

Results of the study indicated the usefulness of using personality dimensions aggregated to the team level to help predict team effectiveness. Conscientiousness (mean and variance), extraversion (minimum), and agreeableness (mean) were related to team performance. Additionally, extraversion (mean and variance) was related to

team viability. Finally, social cohesion was related to team viability and mediated the relationship between extraversion (mean) and team viability. Barrick et al. (1998) highlighted two points of note from their study: (a) personality dimensions at the team level may be important to predicting team effectiveness of teams performing additive tasks, and (b) it is important to consider task type when determining appropriate operationalizations.

In summary, the three studies just discussed (Barrick et al., 1998; Neuman et al., 1999; Neuman & Wright, 1999) all found relationships between dimensions of the Big Five and some aspect of team effectiveness. In addition, three other studies (see Table 1) are instructive to review. First, Barry and Stewart (1997), in a study of 61 teams made up of graduate students, discovered a curvilinear relationship between extraversion and team performance. Second, LePine et al. (1997) found that decision accuracy was high for teams in which the leader and staff were high on cognitive ability and conscientiousness. Finally, a meta-analysis concluded that all five dimensions of the Big Five were related to team performance, depending on the type of task the team was performing (Lonergan et al., 2000). These studies and the theoretical background of the individual personality dimensions previously discussed (conscientiousness, extraversion, and agreeableness), lead to the following hypotheses:

Hypothesis 1: Teams with higher mean levels of conscientiousness will perform better on a majority of objective performance tasks and receive higher team performance ratings than teams with lower mean levels of conscientiousness.

Hypothesis 2: Teams with higher mean levels of extraversion will have higher team member satisfaction ratings than teams with lower mean levels of extraversion.

Hypothesis 2a: Teams with higher variance in team member scores on extraversion will have higher team member satisfaction ratings than teams with lower variance in team member scores on extraversion.

Hypothesis 3: Teams with higher mean levels of agreeableness will perform better on a majority of objective performance tasks, receive higher team performance ratings, and have higher team member satisfaction ratings than teams with lower mean levels of agreeableness.

Emotional Stability and Openness to Experience

The two remaining Big Five personality dimensions that have not received as much attention in the team composition/team performance literature are emotional stability and openness to experience. Both are reviewed here for completeness with respect to testing all of the Big Five personality dimensions as team composition variables.

Emotional stability. Emotional stability, sometimes labeled emotionality, stability, or neuroticism (Barrick & Mount, 1991), has most often been described with traits such as secure, stable, relaxed, self-sufficient, not anxious, and tolerant of stress (Mount et al., 1998). In two recent meta-analyses, mixed results emerged. Barrick and Mount (1991), in their seminal study, found very little support for emotional stability as a predictor of performance for any of the occupational groups (professionals, police, managers, sales, skilled/semi-skilled) or criteria (job proficiency, training proficiency,

personnel data) studied. These findings are different from those reported by Salgado (1997) in which he reported emotional stability was a valid predictor for all occupational groups (with exception of sales) and all criteria. Mount et al. (1998) also found that emotional stability was positively related to performance in jobs that required interpersonal interaction (teamwork).

Several studies have reported emotional stability, aggregated to the team level, as a valid predictor of team effectiveness. Barrick et al. (1998), in a study of 51 work teams in manufacturing and assembly plants, discovered that teams with higher mean levels of emotional stability received higher ratings of team viability. In addition, in a study of 82 work teams of retail assistants, Neuman et al. (1999) concluded that teams with team personality diversity (high variation among the team members) in emotional stability was positively related to team performance.

Openness to experience. Openness to experience (also referred to as intellect or intellectence) has been suggested as the most difficult personality dimension of the Big Five to identify (Barrick & Mount, 1991). The traits associated with openness to experience are being curious, creative, cultured, original, broad-minded, and intelligent (Salgado, 1997). Like emotional stability, the literature shows mixed results for openness to experience. Two meta-analyses showed that openness to experience was a valid predictor for training proficiency (Barrick & Mount, 1991; Salgado, 1997). Only Salgado (1997) found any support for openness to experience as a predictor of performance across occupational groups (police and skilled labor).

Neuman et al. (1999) found that teams with higher mean levels of openness to experience predicted a significant percentage of variance in team performance (ratings of customer service and task completion). Additionally, a recent meta-analysis (Lonergan et al., 2000) showed that team performance on intellectual/analytic tasks was predicted by mean levels of openness to experience. Each of these team-based studies shows promise for further investigation of emotional stability and openness to experience as aggregated team composition variables. Because of differing results in the above studies, competing hypotheses are proposed for emotional stability.

Hypothesis 4: Teams with higher mean levels of emotional stability will perform better on a majority of objective performance tasks and will have higher team member satisfaction ratings than teams with lower mean levels of emotional stability.

Hypothesis 4a: Teams with higher variance in team member scores on emotional stability will perform better on a majority of objective performance tasks and have higher team member satisfaction ratings than teams with lower variance in team member scores on emotional stability.

Hypothesis 5: Teams with higher mean levels of openness to experience will perform better on a majority of objective performance tasks and receive higher team performance ratings than teams with lower mean levels of openness to experience.

Goal Orientation as a Dispositional Variable

Over the past five years, one of the dispositional individual difference variables receiving attention in the literature is goal orientation (Button, Mathieu, & Zajac, 1996; Colquitt & Simmering, 1998; Zweig & Webster, 2000). The present research extends

the literature on the relationship between goal orientation (by aggregating it to the team level) and performance in much the same way as the relationship between individual difference team composition variables and team performance studied by Barrick et al. (1998), Barry and Stewart (1997), Driskell et al. (1988), and others.

Dweck (1986) originally conceived of goal orientation as a mental framework for how persons interpret and respond to achievement situations. Goal orientation has been defined as ". . . dispositions toward developing or demonstrating ability in achievement situations" (VandeWalle, 1997, p. 996). Further, goal orientation can be divided into two broad classes of goals that individuals pursue in achievement situations—learning and performance goal orientation. When approaching a task from a learning goal orientation, the individual's primary objective is to improve and master his or her competence on a given task. On the other hand, when approaching a task from a performance goal orientation, the individual attempts to validate or demonstrate his or her competence by seeking favorable judgments and avoiding negative judgments about his or her competence (Brett & VandeWalle, 1999; Farr, Hofmann, & Ringenback., 1993).

Two different interpretative frameworks surround learning and performance goal orientation that suggest beliefs about effort and ability of the individual. First, Dweck (1986) argued that individuals hold implicit theories about the level of control of personal attributes such as intellectual ability. Individuals with a learning goal orientation follow an incremental theory about their ability and see it as a flexible attribute that can be developed and improved through individual effort and experience.

Alternatively, individuals with a performance goal orientation follow an implicit theory and see their ability as a fixed trait and do not believe they can improve or develop this attribute through effort or experience (Dweck & Leggett, 1988). Second, there is a difference in how individuals with a learning or performance goal orientation view effort expenditure. An individual with a learning goal orientation believes that the amount of effort expended on a task will lead to success on that task. Additionally, an individual's effort on a task is viewed as a means for enhancing (or mastering) his or her ability for future tasks. Individuals with a performance goal orientation, who think of effort as a fixed attribute, view high effort as an indication of low ability because a person with high ability would not need to try so hard to complete a task (Brett & VandeWalle, 1999).

The way in which individuals respond to failure and challenges is also different. If an individual with a learning goal orientation fails at a task or is presented with a challenge, he or she would typically pursue an adaptive response pattern by persisting, increasing his or her effort, and engaging in solution-oriented self-instructions. An individual with a performance goal orientation faced with the same failure or challenge has a maladaptive (or helpless) response pattern illustrated by a tendency to decrease effort or avoidance of the task altogether (Elliott & Dweck, 1988).

Dweck (1975, 1986) in her early research on goal orientation makes little reference to dimensionality of the construct. In fact, her writings seem to indicate that learning and performance goal orientation are on two ends of a continuum (Button et al., 1996). Some have argued that learning and performance goal orientation are

independent constructs (Nicholls, Cheung, Lauer, & Patashnick, 1985, 1989), however no theoretical rationale for this position was given (Button, et al., 1996). Later research posited that goal orientation was clearly not unidimensional. For instance, Button et al. (1996) described goal orientation as a two-dimensional construct (learning and performance orientation). In their research, Button et al. through a series of four studies found strong support for eight-item measures of both learning and performance goal orientation. Although Button et al.'s conceptualization is the most widely accepted, it should be noted that recent research has suggested that the performance goal orientation construct should be split into a performance goal orientation and an avoidance goal orientation (VandeWalle, 1997). The current research adopts the more widely accepted Button et al. conceptualization of goal orientation.

Recent research on goal orientation has shown a positive relationship between learning goal orientation and individual performance and a negative or no relationship between performance goal orientation and individual performance (Kohli, Shervani, & Challagalla, 1998; VandeWalle, Brown, Cron, & Slocum, 1999; Zweig, & Webster, 2000). This researcher found no studies that investigated the relationship between either learning goal orientation or performance goal orientation aggregated to the team level and team performance. The current study examines this relationship using the same theoretical rationale as that used for aggregation of dispositional personality variables to the team level. Namely, goal orientation is a dispositional attribute that individuals on a team possess. However, as with personality dimensions, these

individual attributes must be aggregated in order to characterize the team in terms of this attribute (LePine et al., 1997).

Zweig and Webster (2000), in two studies of over 1,400 participants, investigated two questions: (a) Is there a distinction between goal orientation and the Big Five personality dimensions? and (b) Is there predictive utility associated with goal orientation? Their research found clear evidence that all five of the Big Five personality dimensions were related to goal orientation. The high correlations between the goal orientation constructs and some of the personality dimensions (-.37 to .38), and sampling from similar sets of traits, led Zweig and Webster to ask the question of whether goal orientation will "add anything useful to the prediction of organizational outcomes above and beyond that already offered by an examination of personality" (p. 16). Their regression analysis revealed that goal orientation variables explained unique variance in performance outcomes. Their conclusion was that goal orientation might be tapping a motivational component that the Big Five does not capture. The similarities in the goal orientation variables and Big Five personality dimensions highlighted in Zweig and Webster's study lead to the question of whether goal orientation variables (as a dispositional individual difference variable) aggregated to the team level would explain variance in team effectiveness above and beyond variance of team effectiveness explained by personality dimensions aggregated to the team level.

Learning goal orientation, much like conscientiousness, is a trait that should combine additively in that the more team members with this trait on the team, the better the team performance. Greater learning goal orientation should lead to increased effort

and persistence by team members with the goal of improving abilities. Additionally, when faced with a challenging task, individuals with high learning goal orientation will engage in more solution-oriented self-instruction. Individuals with a performance goal orientation faced with the same challenge have a maladaptive (or helpless) response pattern illustrated by a tendency to decrease effort or avoid the task altogether (Elliott & Dweck, 1988). Therefore, the following hypotheses are proposed:

Hypothesis 6: Teams with higher mean levels of learning goal orientation will perform better on a majority of objective performance tasks and receive higher team performance ratings than teams with lower mean levels of learning goal orientation.

Hypothesis 6a: Teams with higher mean levels of performance goal orientation will perform worse on a majority of objective performance tasks than teams with lower mean levels of performance goal orientation.

Process Variables

Group potency. When observing groups and teams in an organizational context, it becomes obvious that some teams seem to have a confidence or belief that they can be effective as a team. This observation reflects a construct receiving much attention over the past decade. Group potency is defined as a collective belief by members of a team or group, that the team can be effective across tasks (Guzzo, 1986; Shea & Guzzo, 1987). Guzzo, Yost, Campbell, and Shea (1993) suggested group potency was an excellent candidate to add to the I-P-O model to help "fortify the model's capacity to explain group performance" (p. 102). Sayles (1958) suggested several of the issues that now surround the current understanding of potency; these are: (a) teams differ with

respect to the team members' collective belief about the team's effectiveness, (b) this belief is related to actual effectiveness as a cause and consequence, and (c) this belief is shaped by the context in which the team performs (as cited by Guzzo et al., 1993).

The recent literature has caused some confusion between group potency and a similar construct, collective efficacy (also referred to as group efficacy). Guzzo et al. (1993) delineated the difference between these constructs by pointing out that collective efficacy refers to an individual's belief that a team can perform successfully, whereas group potency refers to a shared belief among team members that it can be effective as a team. Another difference that has been proposed is task specificity. Group potency refers to effectiveness across several tasks, whereas collective efficacy is task specific (Gibson, Randel, & Earley, 2000; Guzzo et al., 1993).

A number of studies have found a positive relationship between group potency and team performance. For instance, Campion, Medsker, and Higgs (1993) developed a conceptual framework based on their research of the team and group literature that consisted of five broad themes subdivided into 19 different design characteristics. In testing 80 work groups, they noted that potency (one of the 19 design characteristics--under the process theme) was related to all of the effectiveness measures (objective productivity, managers' judgment, and employee satisfaction). The same basic results were found in a replication of the study using 60 work teams four years later (Campion, Papper, & Medsker, 1996). Other studies have also reported a relationship between group potency and performance (Guzzo et al., 1993; Shea & Guzzo, 1987). These findings lead to the following hypothesis:

Hypothesis 7: Teams with higher mean levels of group potency will perform better on a majority of objective performance tasks, have higher team member satisfaction ratings, and receive higher team performance ratings than teams with lower mean levels of group potency.

Social cohesion. Cohesion has motivated research in many disciplines, to include social psychology, group dynamics, clinical psychology, military psychology, and organizational behavior. There are many definitions of cohesion as it has been operationalized in many ways over the years (Mullen & Copper, 1994). The classic definition comes from Festinger (1950) who defined it as "the resultant forces which are acting on the members to stay in a group" (p. 274). Although there has been confusion over cohesion as a construct, recent meta-analyses seem to indicate that there is a small to moderate relationship between cohesion and performance (Evans, & Dion, 1991; Mullen & Copper, 1994).

Researchers have suggested the critical importance of cohesion to teams and team effectiveness (Hackman, 1987). In the context of the I-P-O framework, one way to view cohesion is the team interaction (communication, cooperation, teamwork) that occurs during the process of team development. Barrick et al. (1998) viewed social cohesion as "a general indicator of synergistic group interaction—or process" (p. 382). Barrick et al. pointed out in their study that a weakness in prior meta-analyses was a lack of definition of the performance criterion. They specifically tested the relationship between social cohesion and team viability (capacity to continue as a viable team). Based on the recent meta-analyses that showed a positive relationship between cohesion

and performance and the findings in Barrick et al., the following hypothesis is proposed:

Hypothesis 8: Teams with higher mean levels of social cohesion will perform better on a majority of objective performance tasks, have higher team member satisfaction ratings, and receive higher team performance ratings than teams with lower mean levels of social cohesion.

Social cohesion, in the context of the definition used in the current study—i.e., a general indicator of synergistic interaction—would lead one to question whether social cohesion might mediate the relationship between interpersonal personality dimensions (agreeableness and extraversion) and performance. Mount et al. (1998), in a meta-analysis involving 11 studies, found that agreeableness was positively related to performance in jobs that required interpersonal interactions and jobs that required teamwork. Additionally, Hough (1992) discovered that agreeableness was related to jobs that required teamwork (cooperativeness of team members, ability to work with others, interpersonal relationship quality, constructive interpersonal behavior) and suggested that the agreeable team member's participation ". . . adds cohesiveness rather than friction" (p. 145). Hurtz and Donovan (2000) in a meta-analysis of 26 studies specifically using the Big Five personality dimensions, found agreeableness was associated with interpersonal facilitation. Van Scotter and Motowidlo (1996) described interpersonal facilitation as ratings of interpersonal relations, being courteous, the quality of interaction with others, cooperation, and being a team player. Finally, Neuman and Wright (1999), in a study of 79, four-person human resource teams in

which agreeableness was aggregated to the team level, agreeableness proved to be predictive of team performance. Extraversion has also been found to relate to performance (Barrick et al., 1998; Mount et al., 1998). Extraversion has been shown to be related to performance in occupations that involve interpersonal skills (Barrick & Mount, 1991). Extraversion has also shown promise in predicting processes and performance (Barrick et al., 1998). Furthermore, Barry and Stewart (1997), in a study of 61, four- and five-person teams attempting problem-solving tasks, found that extraversion was associated with processes and performance at both the individual and team levels. Finally, Barrick et al. (1998), in a study of over 650 employees divided into 51 work teams, concluded that the relationship between extraversion and team viability was mediated by social cohesion. These studies led to the following hypotheses:

Hypothesis 9: Social cohesion will mediate the relationship between team agreeableness (mean) and team member satisfaction.

Hypothesis 9a: Social cohesion will mediate the relationship between team extraversion (mean) and team member satisfaction.

All of the study hypotheses are summarized in Table 2.

Table 2

Summary of Study Hypotheses

	Hypothesis
1	Teams with higher mean levels of conscientiousness will perform better on a majority of objective performance tasks and receive higher team performance ratings than teams with lower mean levels of conscientiousness.
2	Teams with higher mean levels of extraversion will have higher team member satisfaction ratings than teams with lower mean levels of extraversion.
2a	Teams with higher variance in team member scores on extraversion will have higher team member satisfaction ratings than teams with lower variance in team member scores on extraversion.
3	Teams with higher mean levels of agreeableness will perform better on a majority of objective performance tasks, receive higher team performance ratings, and have higher team member satisfaction ratings than teams with lower mean levels of agreeableness.
4	Teams with higher mean levels of emotional stability will perform better on a majority of objective performance tasks and have higher team member satisfaction ratings than teams with lower mean levels of emotional stability.
4a	Teams with higher variance in team member scores on emotional stability will perform better on a majority of objective performance tasks and have higher team member satisfaction ratings than teams with lower variance in team member scores on emotional stability.
5	Teams with higher mean levels of openness to experience will perform better on a majority of objective performance tasks and receive higher team performance ratings than teams with lower mean levels of openness to experience.
6	Teams with higher mean levels of learning goal orientation will perform better on a majority of objective performance tasks and will receive higher team performance ratings than teams with lower mean levels of learning goal orientation.
6a	Teams with higher mean levels of performance goal orientation will perform worse on a majority of objective performance tasks than teams with lower mean levels of performance goal orientation.
7	Teams with higher mean levels of group potency will perform better on a majority of objective performance tasks, have higher team member satisfaction ratings, and receive higher team performance ratings than teams with lower mean levels of group potency.
8	Teams with higher mean levels of social cohesion will perform better on a majority of objective performance tasks, have higher team member satisfaction ratings, and receive higher team performance ratings than teams with lower mean levels of social cohesion.
9	Social cohesion will mediate the relationship between team agreeableness (mean) and team member satisfaction.
9a	Social cohesion will mediate the relationship between team extraversion (mean) and team member satisfaction.

II. METHOD

Participants

All officers (N = 1,158) attending a professional US Air Force military education course at a military school operating on an Air Force installation in the southeast were given the opportunity to participate in this study. Students were assigned to a team when they arrived at the school (day 1). Each team consisted of approximately 13 members, and the teams remained together as a team for the duration of the course (5 weeks). Each team was assigned a team commander (faculty member) who acted as an observer and occasionally helped guide the team toward meeting their goals. The study participants were mid-career officers (5-7 years commissioned service) who attended one of three classes in 2001. The first two classes consisted of 26 teams apiece (n = 640), and the third class consisted of 40 teams (n = 518) for a total of 92 teams included in this study.

Of the 1,158 students, 1,130 (98%) completed questionnaire surveys administered at two different times. Team sizes ranged from 10 to 13 members for the 92 teams with 47 teams (51%) having 13 members. Average age of the respondents was 30.9 years, with mean tenure of 8.4 years of military service. Overall, 83% of the respondents were male, and 35% possessed at least a master's degree. Tests were performed on all demographic variables (gender, age, military tenure, military status,

military rating, undergraduate grade point average, and highest degree earned) to determine if there were any demographic differences among the three classes. No significant differences were found. Therefore, the classes were combined into one sample for analysis purposes.

Research Setting

The school where this study took place conducts the second of four courses in the Air Force professional military education (PME) system. The mission of the school is to develop dynamic leaders rededicated to the profession of arms (Benton, 1999). The purpose of the course is to increase officers' abilities to assume more responsibility in the Air Force, improve their competence, and enhance their dedication to the profession of arms. Assignment to a team was determined by a computer model that considered demographic variables such as gender, military rating (whether a student works on an airplane, is a support officer, or works in a specialty field), military status (regular, reserve/guard, or civilian), and military occupation. During the five weeks, each team remained together and functioned as a team. Each team was considered a self-managing team and had control over how the team accomplished its goals and objectives that were assigned to each team during the first week of class. All decisions regarding amount of effort, use of resources, interpersonal issues, etc., were the responsibility of the team. No designated leaders were assigned to any of the teams as they were expected to emerge depending on the situation. Completion of the course (with objective measures of performance) are entered as part of each officer's permanent military record and are used in future promotion and selection decisions.

Procedures

Table 3 lists the variables that were included in the study and the questionnaire survey (i.e., survey 1, survey 2, or commander survey) including these variables. Two separate administrations of surveys were accomplished. All students were assembled in an auditorium for 20-minutes in week 1 for survey administration 1 and 20-minutes in week 5 for survey administration 2. The input variables of conscientiousness, agreeableness, extraversion, emotional stability, openness to experience, and goal orientation were measured on the first survey (see Appendix A). Group potency, a process variable was also measured on the first survey administration. The process variables (social cohesion and group potency), output variables (team viability and team-member satisfaction), and task interdependence were measured on the second survey (see Appendix B). As will be described later, task interdependence was used to measure the level of task interdependence among team members on each team. Finally, team viability and subjective team performance were measured on the Flight Commander Survey, administered at the end of week 4 of the course (see Appendix C).

The student surveys were administered (at time 1—week 1 and time 2—week 5) to all the students at the same time and in the same place. Students were scheduled for a 20-minute gathering in the auditorium that all were required to attend. They were given a short, 5-minute briefing that explained the purpose of the study, the timetable of the survey administrations, and that participation was voluntary and anonymous. Each officer was assigned a student identification number on the first day of class. The

Table 3

Study Variables Included in the Questionnaire Surveys

Participant First Survey (time 1)	Participant Second Survey (time 2)	Commander Survey (time 2)
1. Team Composition—Input Variables • Conscientiousness • Agreeableness • Extraversion • Emotional stability • Openness to experience • Goal orientation (performance and learning) **2. Demographic Variables** • Gender • Tenure (years in military) • Military status[a] • Military rating[b] • Age (years) • Education level • Undergraduate GPA	**3. Process Variables** • Group potency • Social cohesion **4. Output Variables** • Team viability • Team member satisfaction **5. Other Variables** • Task interdependence **6. Demographic Variables** • Gender • Military status[a] • Military rating[b] • Age (years)	**7. Outcome Variables** • Team viability • Subjective team performance

[a] Denotes active duty, guard/reserve, or civilian.

[b] Denotes whether officer works on airplanes, in a support role, or works in a specialty field.

students were asked to put their student identification number on their time 1 and time 2 surveys. The school maintained the master list with student identification numbers and did not give the researcher access to the list. A cover letter (Appendix D) explained the purpose of the study, what was required of the students, and that responses to the survey were anonymous. These same procedures were used for each of the three classes. Because three separate classes were used in the study, all data were collected over a 4-month period.

All questionnaire survey measures used a 6-point Likert rating scale ranging from strongly disagree (= 1) to strongly agree (= 6) with the exception of the NEO-Five Factor Inventory (FFI). The NEO-FFI is a personality measure which uses a 5-point Likert scale ranging from strongly disagree (= 1) to strongly agree (= 5). More detail on the measures used in this study is provided below.

Aggregation of Individual Team Member Data

In order to aggregate individual-level responses, within-group responses must be examined. Unless team members provide relatively similar responses, individual-level ratings should not be aggregated into a variable that represents a team-level construct (George, 1990). Following Barrick et al. (1998), a within-team interrater agreement statistic (r_{wg}) was calculated for the team process variables (group potency and social cohesion) as well as task interdependence. Results of the r_{wg} calculations are presented in the corresponding sections below. Following the procedure used in other team-level research (c.f., Barry & Stewart, 1997; Barrick et al., 1998; Langfred, 2000; Simons &

Peterson, 2000), if the average r_{wg} for a variable exceeded .70, variables measured at the individual level were aggregated to the group level for analysis.

Measures: Input Variables—Team Composition

Personality. Conscientiousness, agreeableness, extraversion, emotional stability, and openness to experience were assessed using the 60-item NEO Five-Factor Inventory (FFI; Costa & McCrae, 1992). Each of the five personality attributes is measured by 12 items. A high score in conscientiousness indicates a self-disciplined, responsible, organized, and scrupulous individual. A sample conscientiousness item is "I'm pretty good about pacing myself so as to get things done on time." Coefficient alpha for the scale was .80.

A high score in agreeableness indicates someone who is courteous, flexible, trusting, good-natured, cooperative, forgiving, softhearted, and tolerant. A sample agreeableness item is "I generally try to be thoughtful and considerate." Coefficient alpha for the scale was .73.

A high score in extraversion indicates someone who is social, talkative, assertive, and active. A sample extraversion item is "I am a cheerful, high-spirited person." Coefficient alpha for the scale was .79.

A high score in emotional stability indicates someone who is secure, stable, relaxed, self-sufficient, not anxious, and tolerant of stress. A sample emotional stability item is "I rarely feel lonely or blue." Coefficient alpha for the scale was .86.

A high score in openness to experience indicates someone who is curious, creative, cultured, original, broad-minded, and intelligent. A sample openness to

experience item is "I often enjoy playing with theories or abstract ideas." Coefficient alpha for the scale was .71.

Goal orientation. Goal orientation is a 16-item measure developed by Button et al. (1996). It is divided into two subscales— (a) learning and (b) performance goal orientation. Learning goal orientation (i.e., developing competence by acquiring new skills and mastering new situations; Dweck & Leggett, 1988) was assessed using the 8-item subscale developed by Button et al. (1996). A high score on learning goal orientation indicates individuals who seek to develop competence by acquiring new skills and mastering new situations. A sample learning goal orientation item is "The opportunity to extend the range of my abilities is important to me." Coefficient alpha for this subscale was .85.

Performance goal orientation (i.e., desiring to do well and be positively evaluated by others; Farr et al., 1993) was assessed using the 8-item subscale developed by Button et al. (1996). A high score on performance goal orientation indicates individuals who perceive their capabilities to be fixed and seek to approach tasks with the intention of performing well (Dweck & Leggett, 1988). A sample performance goal orientation item is "The opinions others have about how well I can do certain things are important to me." Coefficient alpha for this subscale was .82.

Measures: Process Variables

Social cohesion. Social cohesion is defined as "synergistic interactions between team members, including positive communication, conflict resolution, and effective

workload sharing" (Barrick et al., 1998, p. 382). Social cohesion was assessed using a 4-item measure developed by Seers (1989). A high score on social cohesion indicates synergistic interactions among team members. A sample social cohesion item is "The members of this team got along well with each other." Additionally, within-group agreement (r_{wg}) in social cohesion was calculated prior to aggregating the measure. The mean value of r_{wg} for social cohesion was .82 with 80 of the 92 teams exceeding .70 and 20 of the 92 teams exceeding .90 suggesting aggregation of individual responses was appropriate (George & Bettenhausen, 1990). Coefficient alpha for this scale was .82.

Group potency. Group potency is defined generally as a belief in a group/team about its general effectiveness across multiple tasks (Guzzo et al., 1993). It was measured using the 7-item scale developed by Guzzo et al. (1993). A high score on group potency indicates individuals who believe the team can be effective across multiple tasks. A sample group potency item is "My team believes it can become unusually good at producing high-quality work." Group potency was assessed in both surveys administered at two points in time. Coefficient alphas for this scale were .85 for the first survey administration and .88 for the second survey administration. Within-group agreement (r_{wg}) in group potency for the both survey administrations was calculated prior to aggregating the measure. The mean value of r_{wg} for group potency (first survey) was .91 with 91 of the 92 teams exceeding .70 and 60 of the 92 teams exceeding .90 indicating aggregation of individual responses was appropriate. The mean value of r_{wg} for group potency (second survey) was .84 with 87 of the 92 teams

exceeding .70 and 31 of the 92 teams exceeding .90 suggesting aggregation of individual responses was appropriate.

Measures: Output Variables

Team performance was assessed by a number of objective performance criteria collected on each team over a 5-week period. Table 4 summarizes the team objective performance events tested and their timing of measurement in the current study. These measures of team performance are described below.

Intercorrelations among the 8 objective performance criteria showed them to be generally independent. Based on these intercorrelations, only the physical task exercise measures were significantly correlated ($r = .46$, $p < .01$), hence, the two physical task exercises were combined to form one physical task exercise performance criterion. Each of the other 6 measures were treated as a separate criterion in the study (median intercorrelation among all 7 objective performance measures was .08).

Team leadership problem solving. Team leadership problem solving (TLPS) involved time-pressured exercises that require leadership, followership, communication, and teamwork. Two TLPSs were used in the study. Both TLPSs consisted of two periods: (a) a 45-minute planning period in which the team evaluated a problem and developed a plan to solve the problem and (b) a 15-minute execution period in which the team executed its plan. Team leadership problem solving placed a team in a realistic scenario in which the team was expected to evaluate the problem, develop a plan to solve the problem, and then execute their plan. Scenarios were developed such that input from all team members was expected, and all team members were expected to

Table 4

Objective Measures of Performance

Performance measure	Timing of performance measure
Team leadership problem solving (TLPS)	TLPS 1 in week 2
	TLPS 2 in week 4
Computer simulation exercise	Week 5
Physical task exercise	Physical task exercise 1 in week 3
	Physical task exercise 2 in week 4
Field operations performance	Operation 1 in week 1
	Operation 2 in week 2
	Operation 3 in week 3

understand their role in the plan and perform their role in the plan's execution for the team to have maximum probability for success. A sample TLPS was

> Our intelligence has intercepted an enemy code. You and your team have been tasked to break the code. Each member of your team will be given one piece of information (e.g., "The eagle has landed and the General was seen at headquarters") and the objective of the exercise is to put together all 13 pieces of information in the appropriate order to understand what the code is communicating. Your instructions are to take the next 45 minutes formulating a plan of action, and then you will have 15 minutes to execute your plan. The constraints on your team are as follows: (a) once you receive your piece of information, proceed to the appropriate zone (zones are 100-by-100 foot areas adjacent to one another in a rectangular area—no zone is adjacent to more than one other zone), (b) only the team members with an asterisk (*) on their card may talk (one per zone), (c) you may not show your information to anyone else, (d) only one member at a time may travel to another zone, (e) when you have assembled the code correctly, all team members must come to the staging area and read the correct response. All violations of the rules will result in a 1-minute penalty.

Each team was objectively scored based on maximum performance using (a) successful completion of the TLPS and (b) time required to complete the TLPS. The maximum score for each TLPS was 10 points. Following the first TLPS, a feedback

session was conducted by the team commander to discuss strength areas and areas the team should consider improving for the second team leadership problem solving exercise. Correlation between the two TLPS was (r = -.07, ns). Team total performance scores on TLPS 1 ranged from 0 to 7 points (M = 4.42; SD = 2.36). Team total performance scores on TLPS 2 ranged from 0 to 7 points (M = 1.75; SD = 2.89).

Computer simulation exercise. Each team participated in a computer simulation exercise that was conducted over a two-day period. The teams played the role of a command battle staff responsible for conducting an air war campaign. The computer simulation required a team to develop an air war campaign plan then execute the plan to achieve specified Commander-in-Chief (CINC) objectives in simulated conflict.

Initially, the teams formulated an air war plan to meet the planning objectives specified by the campaign CINC. The plan formulation phase, lasting approximately two hours was followed by a three-hour execution period in which the teams were required to implement their plan by conducting an air operation using an interactive computer simulation. During the execution of the simulated conflict, the teams were expected to execute their air campaign. Computer-scored assessments of team performance consisted of three components: (a) offensive operations, (b) defensive operations, and (c) CINC decision making. Scores from all three components were summed to arrive at a total team computer simulation exercise score that could range from 0 to 22. Because scores were unavailable on each of the three components, total computer simulation exercise scores obtained from school records were used. Total

computer simulation performance scores ranged from 4 to 22 points (M = 13.86; SD = 3.64).

Physical task exercise. Each team participated in 14 timed exercises (seven tasks each on two separate days) involving actual group performance of physical tasks. Each exercise consisted of a written scenario in which teams had to develop assumptions, devise a behavioral plan of action, and then actually carry out their plan. The tasks to be completed were physical and, to a lesser extent, mental exercises in which teams were required to display leadership, followership, group problem solving, and communication in a time-pressured situation. At the start of the exercise, a team was given a written description of a problem situation that identified the parameters/limitations of what the team could do and given a list of the resources available. A sample scenario was

> Your team has been on a reconnaissance mission in enemy territory. You have been evading the enemy and come to a raging river. The bridge has been washed out, and the current is too strong to wade or swim across. You and your team must get to the other side without touching the water, and you must take all of your equipment with you. The only resources you have available to cross the river are a 10-foot piece of rope, and a twelve-foot board. You must accomplish this task in 15 minutes or less.

The teams implemented their solutions in actual, physical settings described in the scenarios. Successful completion of the exercises was based on the team's

performance during the task. Each task successfully accomplished was worth 1 point and if the team accomplished all seven tasks successfully, they received 1 bonus point. Scores could range from 0 to 16 points. There was a relationship between physical task exercise 1 and physical task exercise 2 ($r = .47$, $p < .01$); therefore, the two physical task exercise scores were summed. Total physical task exercise scores ranged from 3 to 16 points ($M = 9.91$; $SD = 2.82$).

Field operations performance. Field operations consisted of three opportunities for teams to plan for and participate in competitive, outdoor field operations. Each team was required to develop a program intended to prepare their team for the field operations. The field operations were designed to help officers learn to apply concepts of communication, leadership, followership, and teamwork to achieve an objective. Field operations pitted each team against another team in a competitive situation. Significant preparation by the team was critical for early success in the field operations. Each field operation was a maximum performance measure; the scoring was based on (a) whether or not the team won the field operation and (b) the size of the victory (i.e., more points awarded for a larger victory). Possible scores for each of the three field operations performance (FOP) measures could range from 0 to 10 points. FOP 1 scores ranged from 0 to 10 ($M = 4.90$; $SD = 3.49$), FOP 2 scores ranged from 0 to 10 ($M = 4.88$; $SD = 3.50$), and FOP 3 scores ranged from 0 to 10 ($M = 4.86$; $SD = 2.98$). No correlations were found among the three FOP scores.

In sum, 7 performance criteria were identified. These criteria included the following: (a) team leadership problem solving (2 measures: TLPS 1 and TLPS 2), (b)

computer simulation exercise, (c) physical task exercise, and (d) field operations performance (3 measures: FOP 1, FOP 2, and FOP 3).

Team performance ratings. In addition to the seven performance criteria described above, an eighth dependent variable used in the study involved commander ratings. Team performance ratings were assessed using a measure modified from Barrick et al. (1998) and developed specifically for this study.

Four commanders serving as subject matter experts (SMEs) were interviewed as to what characteristics they looked for when making a subjective assessment of a team. Based on the criterion of 100% agreement among the SMEs, four characteristics emerged (level of effort of the team, commitment to the team, interpersonal skills of the team, and the team's use of resources). A fifth characteristic, overall evaluation of the team's performance was added following Barrick et al's. (1998) example. Behavioral descriptions and examples (one behavioral example for a team extremely high in the characteristic and one example of a team extremely low in the characteristic) were then developed for all five characteristics (see Figure 3 for an example of the rating scales; the remainder are in Appendix C). Rating scales ranged from "extremely low" (= 1) to "extremely high" (= 6). Surveys were administered to all commanders late in week 4 of the team's performance. A commander's rating of team performance was obtained by summing the commander's rating of their team on the aforementioned characteristics. Commander rating scores ranged from 2.00 to 6.00 (M = 4.26; SD = 1.01). Alpha for this measure was .92.

Team member satisfaction. The ninth dependent variable used in the study was team member satisfaction. Team member satisfaction is one of the three criteria Hackman

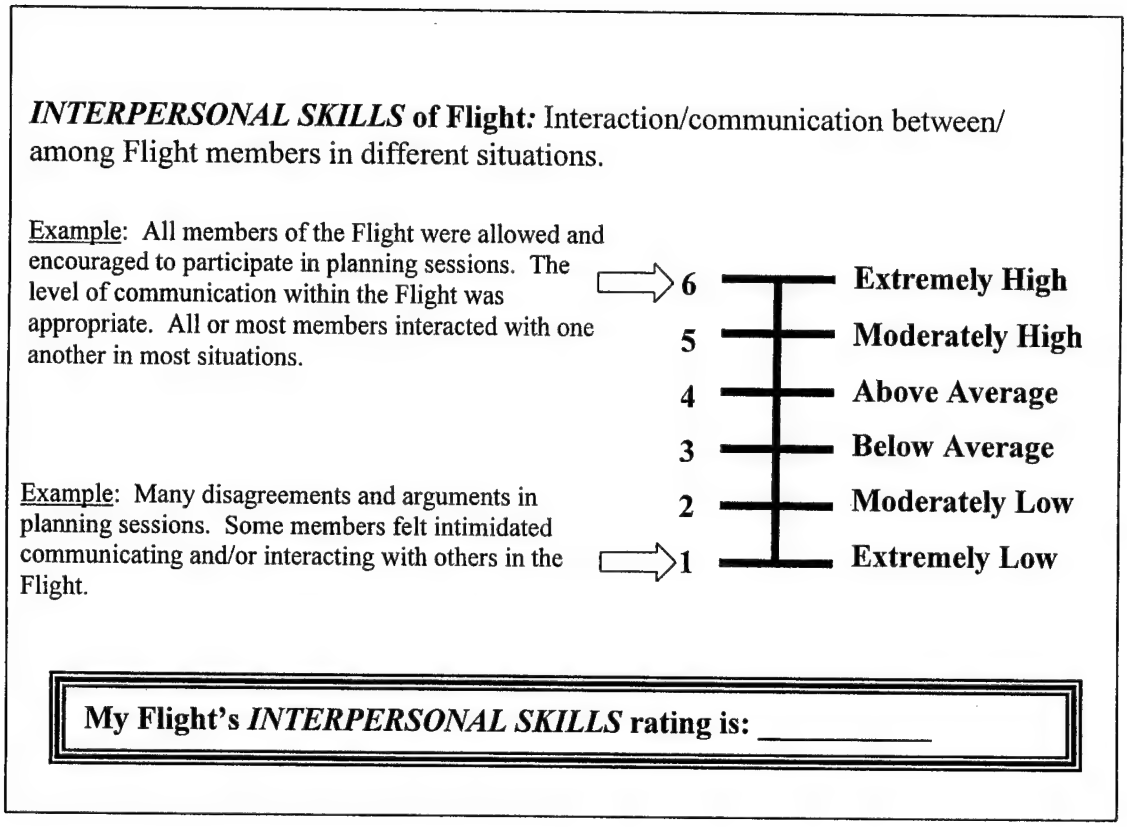


Figure 3. Partial commander team performance rating measure showing one of the five characteristics evaluated by the team commander (see Appendix C for the remaining four scales).

(1987) and Hackman and Morris (1975) identified in defining team effectiveness. Team member satisfaction was measured by modifying the 3-item job satisfaction scale developed by Seashore, Lawler, Mirvis, and Cammann (1982) to represent team member satisfaction with the team. A sample item is "All in all, I am satisfied with this team." The alpha for this measure was .62.

Assessment of team viability. Team viability, the tenth dependent variable, was assessed by the team commander using a scale developed specifically for this study (see Appendix B). This scale used seven items modified from DeStephen and Hirokawa (1988) and Evans and Jarvis (1986). Team viability has been defined as the team's capacity to remain together as a team in the future (Hackman, 1987). A high score on this scale indicates the individual believes the team has the capacity to remain together as a viable team in the future. A sample item from this scale is "I would like to work with members of this team on other projects." Alpha on this measure was .90.

Several issues made the assessment of team viability criterion problematic. First, the hierarchical regression model containing this measure as the dependent variable failed the regression assumption of normality. Second, the correlation between assessment of team viability and team performance rating was high ($r = .80$, $p < .001$). Finally, the distribution of the raw data revealed non-normality. The combination of these three concerns led to the decision to drop commander assessment of team viability as a dependent variable in the study.

Even though the subjective criteria (team performance ratings and team member satisfaction) were moderately correlated ($r = .46$, $p < .01$), the decision was made to treat

them separately. This decision was based on two things: (a) the subjective measures represent ratings from different subjects (commanders and team members) and (b) it was useful and appropriate on a practical level to treat them separately.

Overall, nine criteria were used to test the study's hypotheses; seven of these were objective measures and two were subjective measures. These were (a) team leadership problem solving (TLPS 1 and TLPS 2), (b) computer simulation exercise, (c) physical task exercise, (d) field operations performance (FOP 1, FOP 2, and FOP 3), (e) team performance ratings, and (f) team member satisfaction.

A factor analysis was performed on all of the criteria to determine whether or not some of the criteria could be combined into one or more composite variables. However, because of the uninterpretability of the results and the relatively low intercorrelations among the criteria, it was decided to use the criteria measures as separate dependent variables in the study. The only exception to this was the two physical task exercises, which correlated highly, so these were combined into one criterion.

Measure: Team Interdependence

In order to assess the amount of interdependence within the 92 teams in the study, a 5-item task interdependence measure was used. Four of the five items were taken from the measure used by Bishop and Scott (2000), and one was added specifically for use in this study. Examination of the reliability analysis revealed that by dropping one item from the scale, the reliability increased significantly. Therefore,

one item was dropped, and all subsequent analysis used a 4-item task interdependence measure. The coefficient alpha for the task interdependence scale was .62.

Additionally, within-group agreement (r_{wg}) in task interdependence was calculated prior to aggregating the measure. Individual responses should not be aggregated into a measure that represents a team-level construct unless individual members respond similarly (George, 1990; George & Bettenhausen, 1990). The mean value of r_{wg} for task interdependence was .85 with 86 of the 92 teams exceeding .70 and 42 of the 92 teams exceeding .90 suggesting aggregation of individual responses was appropriate.

Guzzo and Dickson (1996) identified four criteria to define teams. These criteria are (a) individuals who are seen by themselves and others as a social entity, (b) individuals who are task interdependent, (c) individuals who are imbedded in a larger system, and (d) individuals who carry out tasks that influence others (e.g., customers or coworkers). The first and third criteria were met based on the way the teams were assigned and how they functioned at the school they attended. The second and fourth criteria were quantitatively tested using the task interdependence scale. This study used a method similar to that of Barrick et al. (1998) to test whether the teams were interdependent. The mean of the task interdependence measure was 4.91 (on a 6-point scale) with a standard deviation of .68. Any teams with a task interdependence mean of less than 3.5 or more than 2 standard deviations below the mean (4.91) would have been dropped from the study. No teams met these criteria. Therefore, all 92 teams were included in the study.

Control Variables

A number of demographic characteristics were collected from each of the respondents. These included, gender, age, military rating (whether on an airplane, support staff, or works in a specialty field), military status (e.g., active duty, reserves, guard), tenure (years in military), education level, and undergraduate grade point average. Based on prior research (LePine & Van Dyne, 1998; Williams & Parker, 2000), three demographic variables were used as control variables (gender, undergraduate grade point average, and military tenure).

Gender was the first control variable used. Johnson and Schulman (1989) found that males are more likely to participate in teams than are females as well as have more influence than females in mixed-sex groups (Izraeli, 1985). Williams and Parker (2000), in a study of production teams, reported that tenure was related to proactive behavior. Thus, tenure was included in the study as a control variable. Finally, previous research has suggested that GPA/general mental ability can increase team performance (Tziner & Eden, 1985) which precipitated the decision to use GPA of teams as a control variable.

Summary of Measures Used in the Study

Table 5 summarizes the various measures used in the study. The source (authors) of the measures, the number of items in the measures, and the timing of the administration of the measures are also listed in Table 5.

Table 5

Summary of Measures Used in the Study

Variable	Source	Items	Survey
Team composition measures:			
• Goal orientation[a]	Button, Mathieu, and Zajac (1996)	16	S1
• NEO-Five Factor Inventory: The Big Five personality dimensions	Costa and McCrae (1992)	60	S1
Process measures:			
• Group potency	Guzzo, Yost, Campbell, and Shea (1993)	7	S1 and S2
• Social cohesion	Seers (1989)	4	S2 and CS
Subjective performance measures:			
• Team viability	Developed for this study—Based on DeStephen, and Hirokawa (1988); Evans and Jarvis (1986)	7	S2 and CS
• Subjective team performance	Developed for this study—Based on Barrick et al. (1998)	5	CS

Table 5 (continued)

Summary of Measures Used in the Study

Variable	Source	Items	Survey
• Team member satisfaction	Seashore, Lawler, Mirvis and Cammann (1982)	3	S2
Objective performance measures: [b]			
• Team leadership problem solving (TLPS 2 and TLPS 2)	Team outcome performance measure	N/A	N/A
• Computer simulation exercise	Team outcome performance measure	N/A	N/A
• Physical task exercise	Team outcome performance measure	N/A	N/A
• Field operations performance (FOP 1, FOP 2, and FOP 3)	Team outcome performance measure	N/A	N/A
Task interdependence measure	Modified Bishop and Scott (2000) measure	5	S2

Note. S1 = Student survey at time 1 (week 1); S2 = Student survey at time 2 (week 5); CS = Commander survey given in week 4. N/A = Not applicable.

[a] Goal orientation consists of both learning goal orientation (8 items) and performance goal orientation (8 items).

[b] These outcome measures were objectively assessed on each team during the course.

Data Analyses

Predictor variables confirmatory factor analysis. Preliminary correlation analyses revealed a high correlation between the two team process variables (social cohesion and group potency, $r = .82$, $p < .001$). A confirmatory factor analysis was performed on the 11 items that comprised these two variables to determine the most appropriate factor structure. Two models were examined—a one-factor and a two-factor model (see Table 6). A one-factor model was explored first due to the high correlation between social cohesion and group potency. A two-factor model was also considered based on theoretical underpinnings that suggest social cohesion and group potency are separate constructs (Campion et al., 1996; Evans & Dion, 1991; Guzzo et al., 1993; Mullen & Copper, 1994). The goodness-of-fit indices in Table 6 indicate a better fit for the two-factor structure than for the one-factor structure (cf. Hair, Anderson, Tatham, & Black, 1997). A better fit is determined by investigating the goodness-of-fit indices and determining which model suggests a better fit. The indices used for the current study were (a) the chi-square statistic, (b) the normed fit index (should be greater than .90 and higher numbers represent better fit), (c) the comparative fit index (same criteria as normed fit index), (d) the Tucker-Lewis index (same criteria as normed fit index), and the root mean square error of approximation (should be lower than .08 and lower numbers represent better fit). Results of a confirmatory factor analysis accomplished on these same two constructs by Jordan, Feild, and Armenakis (2001) also revealed a two-factor structure. Additionally, a chi-square difference test

Table 6

Confirmatory Factor Analysis for Social Cohesion and Group Potency Items

Model	χ^2	df	χ/df	NFI	CFI	TLI	RMSEA
One-factor	1255.06***	44	28.52	.97	.97	.96	.16
Two-factor	689.59***	43	16.04	.98	.99	.98	.12

Note. N = 92 for all chi-squares. NFI = normed fit index; CFI = comparative fit index; TLI = Tucker-Lewis fit index; RMSEA = root mean square error of approximation.

*** $p < .001$.

was performed that revealed a significant difference between the two-factor structure and the one-factor structure ($\chi^2 = 565.47$, $p < .005$). Therefore, social cohesion and group potency were judged to be separate constructs for this study.

Power analyses. Because of the small sample size for this study ($N = 92$), the statistical power for each of the nine hierarchical regression models was calculated for a .05 significance-level. The statistical power for the models ranged from .46 to .99. One recommendation to increase statistical power is to increase the significance level (Sall & Lehman, 1996). Because some of the models tested in the study had low statistical power, a significance level of .10 was used in all tests of hypotheses.

Hypotheses tests. Hierarchical regression analysis was performed to test study Hypotheses 1-8. Hierarchical regression analyses will indicate whether particular predictor variables are related to the criteria and will also indicate whether the predictor variables explain unique variance in the criteria. Control variables were entered into the hierarchical regression first, followed by goal orientation, the personality variables, and finally the group process variables. The order the variables were entered was based on the logical flow inherent in the Input-Process-Outcome framework (Hackman, 1987, 1990).

Hypothesis 9, i.e., social cohesion will mediate the relationship between agreeableness (team mean) with the criteria of team member satisfaction and team viability, was examined following the procedure suggested by Baron and Kenny (1986). Additionally, Hypothesis 9a, i.e., social cohesion will mediate the relationship between

extraversion (team mean) with the criteria of team member satisfaction and team viability, was examined following the same procedure used in testing Hypothesis 9.

III. RESULTS

This chapter reports the empirical test results for each of the research hypotheses. In the first section, descriptive statistics and intercorrelations among the variables at the individual-level and at the group-level (aggregated) are presented. In the next section, results from tests of the study's hypotheses are provided.

Descriptive Statistics and Intercorrelations

Among Study Variables

Table 7 presents the means, standard deviations, intercorrelations, and coefficient alphas for the study variables at the individual team member level. All alphas for the multi-item variables, with the exception of team-member satisfaction (α = .62), exceeded the threshold of .70 suggested by Nunnally (1978). Table 8 presents the means, standard deviations, intercorrelations, and coefficient alphas for the study variables, aggregated to the team level. All subsequent analyses use the aggregated team-level variables shown in Table 8.

Table 8 reveals some correlations that bear mention. For example, overall undergraduate college grade point average (GPA), which has been shown to be a good proxy for general mental ability (Jensen, 1998; Roth & Bobko, 2000), was related to team performance ratings (r = .19, p < .05). Furthermore, previous research

Table 7

Means, Standard Deviations, Intercorrelations, and Coefficient Alphas of Study Variables (Individual Team Member Level)

Variable	Mean	SD	1	2	3	4
Control variables:						
1. Gender [a]	0.17	.38	--[b]			
2. Military tenure (years)	8.38	1.03	-.05	--[b]		
3. Grade point average (GPA)	3.18	.12	.11**	.30**	--[b]	
Input variables:						
4. Performance goal orientation	4.48	.19	.03	.02	-.01	(.82)
5. Learning goal orientation	5.10	.16	.03	-.03	.06*	-.13**
6. Conscientiousness	3.93	.13	.06*	-.01	.17**	-.05
7. Extraversion	3.68	.14	.11**	-.08**	.02	-.09**
8. Emotional stability	3.74	.60	.12**	-.02	.02	.26**
9. Openness to experience	3.34	.13	.06*	-.06*	.02	-.22**
10. Agreeableness	3.67	.12	.12**	-.04	.08**	.04
Process variables:						
11. Group potency (time 1)	5.03	.56	.01	.00	-.03	.12**
12. Social cohesion	4.73	.60	-.03	.02	.04	-.01
13. Group potency (time 2)	4.66	.55	-.02	.02	.02	-.01
Outcome variable:						
14. Team member satisfaction	4.78	.46	.03	.05	.07*	.00
Team aggregation variable						
15. Task interdependence	4.91	.68	.03	-.02	.05	.11**

Table 7 (continued)

Means, Standard Deviations, Intercorrelations, and Coefficient Alphas of Study Variables (Individual Team Member Level)

Variable	5	6	7	8	9	10
Control variables:						
1. Gender[a]						
2. Military tenure (years)						
3. Grade point average (GPA)						
Input variables:						
4. Performance goal orientation						
5. Learning goal orientation	(.85)					
6. Conscientiousness	.37**	(.80)				
7. Extraversion	.45**	.30**	(.79)			
8. Emotional stability	.31**	.39**	.40**	(.86)		
9. Openness to experience	.30**	-.02	.20**	.04	(.71)	
10. Agreeableness	.08**	.15**	.20**	.20**	-.02	(.73)
Process variables:						
11. Group potency (time 1)	.34**	.21**	.27**	.16**	.04	.07*
12. Social cohesion	.05	.07*	.12**	.10**	.00	.17**
13. Group potency (time 2)	.13**	.08**	.15**	.07*	.00	.15**
Outcome variable:						
14. Team member satisfaction	.06*	.02	.14**	.06*	.03	.20**
Team aggregation variable						
15. Task interdependence	.14**	.04	.12**	.02	.02	.13**

Table 7 (continued)

Means, Standard Deviations, Intercorrelations, and Coefficient Alphas of Study Variables (Individual Team Member Level)

Variable	11	12	13	14	15
Control variables:					
1. Gender[a]					
2. Military tenure (years)					
3. Grade point average (GPA)					
Input variables:					
4. Performance goal orientation					
5. Learning goal orientation					
6. Conscientiousness					
7. Extraversion					
8. Emotional stability					
9. Openness to experience					
10. Agreeableness					
Process variables:					
11. Group potency (time 1)	(.85)				
12. Social cohesion	.21**	(.82)			
13. Group potency (time 2)	.32**	.64**	(.88)		
Outcome variable:					
14. Team member satisfaction	.14**	.67**	.58**	(.62)	
Team aggregation variable					
15. Task interdependence	.13**	.30**	.30**	.35**	(.62)

Note. Coefficient alphas are shown in parentheses. Sample sizes ranged from N = 1,129 to N = 1,157.

[a] 0 = male, 1 = female.

[b] Reliability information was not available.

* $p < .05$. ** $p < .01$.

Table 8

Means, Standard Deviations, Intercorrelations, and Coefficient Alphas of Study Variables (Team Level)

Variable	Mean	SD	1	2	3
Control variables:					
1. Gender[a]	0.17	.05	--[b]		
2. Military tenure (years)	8.38	.03	-.15	--[b]	
3. Grade point average (GPA)	3.18	.12	-.03	.17	--[b]
Input variables:					
4. Performance goal orientation	4.48	.19	-.11	-.19*	-.16
5. Learning goal orientation	5.10	.16	.12	-.18*	.01
6. Conscientiousness	3.93	.13	.18	.03	.10
7. Extraversion (mean)	3.68	.14	.06	-.17	-.03
8. Extraversion (variance)	.25	.12	-.03	.13	.04
9. Emotional stability (mean)	3.74	.14	-.11	.21*	-.15
10. Emotional stability (variance)	.37	.17	.07	-.27**	-.09
11. Openness to experience	3.34	.13	-.07	-.20	-.07
12. Agreeableness	3.67	.12	-.15	-.03	-.12
Process variables:					
13. Social cohesion	4.73	.60	-.01	.09	.13
14. Group potency (time 2)	4.66	.55	.02	.05	.07
Outcome variables:					
15. Team leadership problem solving 1	4.42	2.36	.06	.04	.15
16. Team leadership problem solving 2	1.75	2.89	.25*	-.06	.00
17. Computer simulation exercise	13.86	3.64	-.19	.14	.09
18. Physical task exercise	9.91	2.82	-.26*	.06	-.08
19. Field operations performance 1	4.90	3.49	-.11	-.07	.24*
20. Field operations performance 2	4.88	3.50	-.10	.04	-.26**
21. Field operations performance 3	4.86	2.98	-.06	.10	-.03
22. Team performance ratings	4.27	1.01	-.01	.12	.19*
23. Team member satisfaction	4.78	.46	.04	.00	.10

Table 8 (continued)

Means, Standard Deviations, Intercorrelations, and Coefficient Alphas of Study Variables (Team Level)

Variable	4	5	6	7	8
Control variables:					
1. Gender[a]					
2. Military tenure (years)					
3. Grade point average (GPA)					
Input variables:					
4. Performance goal orientation	(.82)				
5. Learning goal orientation	-.03	(.85)			
6. Conscientiousness	.00	.39**	(.80)		
7. Extraversion (mean)	.08	.48**	.32**	(.79)[b]	
8. Extraversion (variance)	-.03	-.28**	-.08	-.26*	(.79)[b]
9. Emotional stability (mean)	-.25*	.23*	.28**	.23*	-.04
10. Emotional stability (variance)	.28**	-.14	-.22*	-.17	.16
11. Openness to experience	-.13	.26**	-.12	.23*	-.12
12. Agreeableness	.04	-.17	.08	-.17	-.02
Process variables:					
13. Social cohesion	-.20	.01	.09	.17	-.11
14. Group potency (time 2)	-.09	.16	.08	.23*	-.21*
Outcome variables:					
15. Team leadership problem solving 1	-.23*	.11	-.02	.18*	.00
16. Team leadership problem solving 2	-.20	.15	.07	-.02	-.13
17. Computer simulation exercise	-.05	-.01	-.11	.01	.01
18. Physical task exercise	.17	.01	-.03	-.01	-.04
19. Field operations performance 1	-.16	.13	.09	.04	-.03
20. Field operations performance 2	.04	-.04	-.07	-.03	.09
21. Field operations performance 3	.06	.09	.02	.21*	-.05
22. Team performance ratings	-.12	.00	.03	.01	.03
23. Team member satisfaction	-.08	.00	-.03	.13	-.10

Table 8 (continued)

Means, Standard Deviations, Intercorrelations, and Coefficient Alphas of Study Variables (Team Level)

Variable	9	10	11	12	13
Control variables:					
1. Gender[a]					
2. Military tenure (years)					
3. Grade point average (GPA)					
Input variables:					
4. Performance goal orientation					
5. Learning goal orientation					
6. Conscientiousness					
7. Extraversion (mean)					
8. Extraversion (variance)					
9. Emotional stability (mean)	(.86)[b]				
10. Emotional stability (variance)	-.45**	(.86)[b]			
11. Openness to experience	-.01	.16	(.71)		
12. Agreeableness	.10	.05	-.20	(.73)	
Process variables:					
13. Social cohesion	.06	-.15	-.04	.19	(.82)
14. Group potency (time 2)	.06	-.10	.01	.03	.82**
Outcome variables:					
15. Team leadership problem solving 1	.09	-.14	.16	-.18	.32**
16. Team leadership problem solving 2	-.06	-.01	.01	-.13	.08
17. Computer simulation exercise	.18	-.10	.07	-.18	.21*
18. Physical task exercise	.00	.09	.09	.00	.21*
19. Field operations performance 1	.11	-.05	-.06	-.11	.31**
20. Field operations performance 2	.11	-.06	-.10	.17	.19
21. Field operations performance 3	.02	.08	-.06	-.16	.11
22. Team performance ratings	.01	-.05	-.18	.06	.59**
23. Team member satisfaction	.02	-.16	-.14	.19	.82**

Table 8 (continued)

Means, Standard Deviations, Intercorrelations, and Coefficient Alphas of Study Variables (Team Level)

Variable	14	15	16	17	18
Control variables:					
1. Gender[a]					
2. Military tenure (years)					
3. Grade point average (GPA)					
Input variables:					
4. Performance goal orientation					
5. Learning goal orientation					
6. Conscientiousness					
7. Extraversion (mean)					
8. Extraversion (variance)					
9. Emotional stability (mean)					
10. Emotional stability (variance)					
11. Openness to experience					
12. Agreeableness					
Process variables:					
13. Social cohesion					
14. Group potency (time 2)	(.88)				
Outcome variables:					
15. Team leadership problem solving 1	.36**	--[b]			
16. Team leadership problem solving 2	.22*	-.07	--[b]		
17. Computer simulation exercise	.30**	.24*	.18	--[b]	
18. Physical task exercise	.41**	-.08	.13	.31**	--[b]
19. Field operations performance 1	.47**	.21*	.07	.17	.26*
20. Field operations performance 2	.28**	-.12	.21*	.14	.10
21. Field operations performance 3	.17	.14	-.02	.07	-.04
22. Team performance ratings	.71**	.26*	.31**	.27*	.37**
23. Team member satisfaction	.76**	.27*	.02	.22*	.20

Table 8 (continued)

Means, Standard Deviations, Intercorrelations, and Coefficient Alphas of Study Variables (Team Level)

Variable	19	20	21	22	23
Control variables:					
1. Gender[a]					
2. Military tenure (years)					
3. Grade point average (GPA)					
Input variables:					
4. Performance goal orientation					
5. Learning goal orientation					
6. Conscientiousness					
7. Extraversion (mean)					
8. Extraversion (variance)					
9. Emotional stability (mean)					
10. Emotional stability (variance)					
11. Openness to experience					
12. Agreeableness					
Process variables:					
13. Social cohesion					
14. Group potency (time 2)					
Outcome variables:					
15. Team leadership problem solving 1					
16. Team leadership problem solving 2					
17. Computer simulation exercise					
18. Physical task exercise					
19. Field operations performance 1	--[b]				
20. Field operations performance 2	.01	--[b]			
21. Field operations performance 3	.05	.06	--[b]		
22. Team performance ratings	.51**	.28**	.21*	(.92)	
23. Team member satisfaction	.27*	.16	.00	.48**	(.62)

Note. N = 92 for all intercorrelations.

[a] 0 = male, 1 = female.

[b] Reliability information was not available.

* $p < .05$. ** $p < .01$.

has suggested a relationship between general mental ability/GPA and performance (Hunter & Hunter, 1984; Pearlman et al., 1980). Thus, the relationship between GPA and team performance ratings in this study was not surprising.

As mentioned earlier, while there were some significant intercorrelations among the criteria, the intercorrelations were not so strong as to suggest that these criteria should be combined into a single composite criterion. For the 9 criteria, the intercorrelations ranged from -.12 to .51 with a median intercorrelation of .18. Accordingly, each criterion, with the exception of physical task exercise where the two physical exercise measures were combined, was analyzed with separate multiple regression models.

Hypotheses Tests

Hierarchical regression analysis was used to test all of the hypotheses, with the exception of Hypotheses 9 and 9a. Hypotheses 9 and 9a were tested using mediation analysis. Tables 9 through 13 present the results from the models tested in the study. Table 9 provides results for the hierarchical regression analyses using the two subjective measures (team member satisfaction and team performance ratings) as dependent variables. Table 10 contains the results from the tests of hypotheses predicting that teams with higher variance in extraversion will have higher team member satisfaction ratings than teams with lower variance (Hypothesis 2a), and teams with higher variance in emotional stability will perform better than teams with lower variance in emotional stability (Hypothesis 4a). Team member satisfaction was tested twice because

Table 9

Hierarchical Regression Analyses of Control, Input, and Process Variables with Team Member Satisfaction and Team Performance Ratings

	Subjective performance criteria					
	Team member satisfaction			Team performance ratings		
Variable entry order	ΔR^2	b[b]	t	ΔR^2	b[b]	t
Step 1—Control variables:	.01			.04		
Gender[a]		.07	1.08		-.03	-.41
Military tenure (years)		-.07	-1.03		-.01	-.13
Grade point average (undergraduate)		.04	.69		.12	1.47†
Step 2—Goal orientation:	.00			.01		
Performance goal orientation		.05	.66		-.07	-.83
Learning goal orientation		.01	.15		-.02	-.21
Step 3—Personality:	.12*			.04		
Conscientiousness		-.16	-2.29*		-.02	-.19
Extraversion (mean)		.03	.40		-.10	-1.03
Emotional stability (mean)		.03	.47		-.01	-.05
Openness to experience		-.13	-1.93*		-.18	-2.09*
Agreeableness		.07	1.12		.01	.07
Step 4—Process variables:	.58***			.48***		
Group potency (time 2)		.29	2.62**		.78	5.60***
Social cohesion		.58	5.04***		-.07	-.49
Overall model F	18.13***			8.75***		
Total R^2	.73			.57		
Adjusted R^2	.70			.51		

Note. N = 92 teams. Only final model results are reported.

[a] 0 = male, 1 = female.

[b] Standardized beta weights.

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 10

Hierarchical Regression Analyses of Control, Input, and Process Variables with Team Member Satisfaction Using Variance for Team Extraversion and Emotional Stability

	Subjective performance criteria		
	Team member satisfaction		
Variable entry order	ΔR^2	b[b]	t
Step 1—Control variables:	.01		
Gender[a]		.08	1.30†
Military tenure (years)		-.09	-1.39†
Grade point average (undergraduate)		.04	.66
Step 2—Goal orientation:	.00		
Performance goal orientation		.07	1.13
Learning goal orientation		.02	.24
Step 3—Personality:	.09		
Conscientiousness		-.17	-2.49**
Extraversion (variance)[c]		.05	.74
Emotional stability (variance)[c]		-.12	-1.82*
Openness to experience		-.10	-1.46†
Agreeableness		.09	1.38†
Step 4—Process variables:	.63***		
Group potency (time 2)		.31	2.85**
Social cohesion		.56	4.98***
Overall model F	19.06***		
Total R^2	.74		
Adjusted R^2	.70		

Note. N = 92 teams. Only final model results are reported.

[a] 0 = male, 1 = female.

[b] Standardized beta weights.

[c] Team extraversion and emotional stability are based on team variance rather than team mean.

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Hypotheses 2, 2a, 4, and 4a are competing hypotheses (using team mean, see Table 9 and using team variance, see Table 10) for both extraversion and emotional stability. Tables 11 through 13 reveal the results of the hierarchical tests for the objective performance criteria (i.e., team leadership problem solving 1 and 2, computer simulation exercise, physical task exercise, and field operations performance exercises 1 through 3). Since some of the hypotheses are multi-part hypotheses (predicting relationships between independent variables for both subjective and objective criteria), Tables 9 through 13 will be referenced in the reporting of the hypotheses results.

Control Variables

Before reporting the hypotheses testing results, a few relationships involving the control variables should be noted. Military tenure (years) was negatively related to field operations performance 1 ($t = -2.69$, $p < .01$; see Table 13). Because field operations performance required agility, athletic ability, hand-eye coordination, and stamina, it was expected that tenure would be negatively related to this criterion. Additionally, gender was negatively related to physical task exercise ($t = -2.47$, $p < .01$; see Table 12) suggesting that teams with a higher proportion of females performed worse than teams with a lower proportion of females. Physical task exercise, as the name suggests, was a physically demanding exercise. The field operations performance (FOP) exercises were also physically demanding. As expected, FOP 1 was significant and showed a negative relationship between gender and team performance ($t = -2.16$, $p < .05$; see Table 13).

Table 11

Hierarchical Regression Analyses of Control, Input, and Process Variables with Team Leadership Problem Solving Exercises 1 and 2

	Objective performance criteria					
	Team leadership problem solving 1			Team leadership problem solving 2		
Variable entry order	ΔR^2	b[b]	t	ΔR^2	b[b]	t
Step 1—Control variables:	.03			.06		
Gender[a]		.05	.44		.15	1.41†
Military tenure (years)		-.01	-.04		-.07	-.64
Grade point average (undergraduate)		.12	1.12		-.06	-.52
Step 2—Goal orientation:	.05			.05		
Performance goal orientation		-.13	-1.16		-.25	-2.18*
Learning goal orientation		-.02	-.16		.10	.77
Step 3—Personality:	.06			.03		
Conscientiousness		-.09	-.73		.07	.55
Extraversion		.09	.68		-.13	-.99
Emotional stability		.09	.72		-.11	-.94
Openness to experience		.10	.90		-.06	-.53
Agreeableness		-.14	-1.26		-.06	-.55
Step 4—Process variables:	.10**			.08*		
Group potency (time 2)		.27	1.43†		.51	2.68**
Social cohesion		.08	.39		-.35	-1.76*
Overall model F	2.01*			1.81†		
Total R^2	.23			.22		
Adjusted R^2	.12			.10		

Note. N = 92 teams. Only final model results are reported.

[a] 0 = male, 1 = female.

[b] Standardized beta weights.

† $p < .10$. * $p < .05$. ** $p < .01$.

Table 12

Hierarchical Regression Analyses of Control, Input, and Process Variables on Computer Simulation and Physical Task Exercises

	Objective performance criteria					
	Computer simulation exercise			Physical task exercise		
Variable entry order	ΔR^2	b[b]	t	ΔR^2	b[b]	t
Step 1—Control variables:	.05			.08†		
Gender[a]		-.15	-1.39†		-.25	-2.47**
Military tenure (years)		.02	.21		.05	.44
Grade point average (undergraduate)		.10	.89		-.08	-.84
Step 2—Goal orientation:	.00			.02		
Performance goal orientation		.07	.61		.16	1.46†
Learning goal orientation		-.06	-.50		-.06	-.47
Step 3—Personality:	.09			.01		
Conscientiousness		-.11	-.92		.08	.72
Extraversion		-.10	-.84		-.15	-1.25
Emotional stability		.26	2.19*		.00	-.03
Openness to experience		.06	.50		.12	1.13
Agreeableness		-.23	-2.10*		-.03	-.24
Step 4—Process variables:	.11**			.23***		
Group potency (time 2)		.36	1.97*		.74	4.27***
Social cohesion		-.03	-.16		-.34	-1.86*
Overall model F	2.12*			3.37***		
Total R^2	.24			.34		
Adjusted R^2	.13			.24		

Note. N = 92 teams. Only final model results are reported.

[a] 0 = male, 1 = female.

[b] Standardized beta weights.

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 13

Hierarchical Regression Analyses of Control, Input, and Process Variables with Field Operations Performance Exercises 1 and 2

	Objective performance criteria					
	Field operations performance 1			Field operations performance 2		
Variable entry order	ΔR^2	b[b]	t	ΔR^2	b[b]	t
Step 1—Control variables:	.09*			.09*		
Gender[a]		-.21	-2.16*		-.09	-.79
Military tenure (years)		-.27	-2.69**		.02	.17
Grade point average (Undergraduate)		.22	2.34*		-.26	-2.33**
Step 2—Goal orientation:	.04			.00		
Performance goal orientation		-.16	-1.56†		.01	.05
Learning goal orientation		.00	.02		.00	-.02
Step 3—Personality:	.05			.03		
Conscientiousness		.08	.77		-.07	-.54
Extraversion		-.14	-1.24		-.06	-.45
Emotional stability		.13	1.26		.06	.54
Openness to experience		-.14	-1.39†		-.10	-.91
Agreeableness		-.15	-1.52†		.11	.96
Step 4—Process variables:	.23***			.09**		
Group potency (time 2)		.71	4.29***		.43	2.27*
Social cohesion		-.28	-1.63†		-.15	-.74
Overall model F	4.41***			1.75†		
Total R^2	.40			.21		
Adjusted R^2	.31			.09		

Note. N = 92 teams. Only final model results are reported.

[a] 0 = male, 1 = female.

[b] Standardized beta weights.

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 13 (continued)

Hierarchical Regression Analyses of Input and Process Variables with Field Operations Performance Exercise 3

	Objective performance criteria		
	Field operations performance 3		
Variable entry order	ΔR^2	b[b]	t
Step 1—Control variables:	.02		
Gender[a]		-.09	-.80
Military tenure (years)		.12	1.04
Grade point average (undergraduate)		-.09	-.74
Step 2—Goal orientation:	.02		
Performance goal orientation		.04	.29
Learning goal orientation		.04	.29
Step 3—Personality:	.07		
Conscientiousness		-.04	-.34
Extraversion		.21	1.56†
Emotional stability		-.05	-.43
Openness to experience		-.14	-1.14
Agreeableness		-.16	-1.36†
Step 4—Process variables:	.02		
Group potency (time 2)		.12	.61
Social cohesion		.01	.06
Overall model F	.92		
Total R^2	.12		
Adjusted R^2	.00		

Note. N = 92 teams. Only final model results are reported.

[a] 0 = male, 1 = female.

[b] Standardized beta weights.

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Input Variables—Personality

Conscientiousness. Hypothesis 1 proposed that teams with higher mean levels of conscientiousness would perform better on the majority of objective performance tasks and receive higher team performance ratings than teams with lower mean levels of conscientiousness. Tables 11 through 13 show that, contrary to expectations, there were no relationships between mean levels of team conscientiousness and the objective performance measures, i.e., team leadership problem solving, computer simulation exercise, physical task exercise, and field operations performance (t values ranged from -.92 to .77, all non-significant). With relation to the subjective criterion, Table 9 confirms that conscientiousness was not related to team performance ratings (t = -.19, ns). Thus, Hypothesis 1 was not supported.

Extraversion. Hypothesis 2 predicted that teams with higher mean levels of extraversion would report higher team member satisfaction than teams with lower mean levels of extraversion. Examination of the results (see Table 9) revealed that teams with higher mean levels of extraversion did not have higher levels of team member satisfaction than teams with lower mean levels of extraversion (t = .40, ns). Therefore, Hypothesis 2 was not supported. Moreover, Hypothesis 2a was also not supported. Teams with higher variance in team member scores on extraversion (see Table 10) did not have higher team member satisfaction than teams with lower variance in their extraversion scores (t = .74, ns).

Agreeableness. Hypothesis 3, i.e., teams with higher mean levels of agreeableness will perform better on the majority of objective performance tasks,

receive higher ratings of team performance, and have higher team member satisfaction ratings than teams with lower mean levels of agreeableness, was tested using all of the dependent variables. Table 9 shows that teams with higher mean levels of agreeableness did not have higher team member satisfaction ratings ($t = 1.12$, ns) or receive higher team performance ratings ($t = .07$, ns) than teams with lower mean levels of agreeableness. In considering the two team leadership problem solving criteria, physical task exercise criterion, and field operations performance 2 criterion, teams with higher mean levels of agreeableness did not perform better than teams with lower mean levels of agreeableness (t values ranged from -1.26 to .96; see Tables 11 through 13). The only three objective performance criteria that showed significance were the computer simulation exercise ($t = -2.10$, $p < .05$; see Table 12), FOP 1 ($t = -1.52$, $p < .10$; see Table 13), and FOP 3 ($t = -1.36$, $p < .10$; see Table 13). However, the results for all three of these criteria were opposite of that hypothesized. Teams with higher mean levels of agreeableness performed worse on the computer simulation exercise, FOP 1, and FOP 3 criteria than teams with lower mean levels of agreeableness. Therefore, Hypothesis 3 was not supported.

Emotional stability. It was proposed in the fourth hypothesis that teams with higher mean levels of emotional stability would perform better on the majority of objective performance tasks and would have higher team member satisfaction ratings than teams with lower mean levels of emotional stability. Table 12 revealed that teams with higher mean levels of emotional stability did perform better on the computer simulation exercise than teams with lower mean levels of emotional stability ($t = 2.19$, p

< .05). All other objective performance tasks were non-significant (t values ranged from –.94 to 1.26; see Tables 11 through 13). As shown in Table 9, teams with higher mean levels of emotional stability did not have higher team member satisfaction ratings than teams with lower emotional stability ratings (t = .47, ns). Hypothesis 4 was partially supported.

The competing Hypothesis 4a proposed that teams with higher variance in team member scores on emotional stability would have higher team member satisfaction ratings than teams with lower variance in team member emotional stability scores. The results shown in Table 10 revealed a relationship opposite from that predicted. Teams with higher variance in team member emotional stability scores had lower team member satisfaction ratings than teams with lower team member satisfaction variance (t = -1.82, p < .05). Thus, Hypothesis 4a was not supported.

Openness to experience. Hypothesis 5 stated that teams with higher mean levels of openness to experience will perform better on the majority of objective performance tasks and receive higher ratings of team performance than teams with lower mean levels of openness to experience. On the objective tasks (both team leadership problem solving exercises, computer simulation exercise, physical task exercise, and all three field operations performance exercises), openness to experience did not perform as expected. Investigation of the hierarchical regression results reported in Tables 11 through 13 revealed that teams with higher mean levels of openness to experience did not perform better on the majority of objective performance tasks than teams with lower mean levels of openness to experience (t values ranged from -1.14 to 1.13, all non-

significant). In fact, FOP 1 (see Table 13) revealed that openness to experience reacted opposite of that predicted ($t = -1.52$, $p < .10$). With regard to the subjective criterion of team performance ratings, openness to experience correlated opposite from that hypothesized. Teams with higher mean levels of openness to experience received lower team performance ratings than teams with lower mean levels or openness to experience ($t = -2.09$, $p < .05$; see Table 9). Therefore, Hypothesis 5 was not supported.

Learning goal orientation. Hypothesis 6 predicted that teams with higher mean levels of learning goal orientation would perform better on a majority of objective performance tasks and receive higher team performance ratings than teams with lower mean levels of learning goal orientation. Because learning goal orientation was non-significant in all models tested (t values ranged from -.53 to .81, all non-significant, see Tables 9, 11-13), Hypothesis 6 was not supported.

Performance goal orientation. Hypothesis 6a stated that teams with a higher mean level of performance goal orientation would perform worse on a majority of the objective performance measures than teams with lower mean levels of performance goal orientation. As Tables 11 and 13 indicate, performance goal orientation was negatively related to team leadership problem solving 2 ($t = -2.18$, $p < .05$) and field operations performance 1 ($t = -1.56$, $p < .10$) . Additionally, performance goal orientation was not related to 4 of the remaining 5 objective performance measures (t values ranging from –1.16 to .61, all non-significant; see Tables 11 through 13). Thus, Hypothesis 6a was partially supported.

Group potency (time 2). Hypothesis 7 predicted that teams with higher mean levels of group potency (measured at time 2) would perform better on a majority of the objective performance criteria, have higher ratings of team member satisfaction, and receive higher team performance ratings than teams with lower mean levels of group potency. With respect to the subjective criteria, teams with higher mean levels of group potency had higher team member satisfaction ratings ($t = 2.62$, $p < .01$; see Table 9) and higher team performance ratings ($t = 5.60$, $p < .001$; see Table 9). Additionally, Tables 11 through 13 indicate that teams with higher mean levels of group potency performed better on 6 of the 7 objective performance criteria: team leadership problem solving 1 ($t = 1.43$, $p < .10$), team leadership problem solving 2 ($t = 2.68$, $p < .01$), computer simulation exercise ($t = 1.97$, $p < .05$), physical task exercise ($t = 4.27$, $p < .001$), field operations performance 1 ($t = 4.29$, $p < .001$), and field operations performance 2 ($t = 2.27$, $p < .05$). Group potency was not associated with field operations performance 3 ($t = .61$, ns). Thus, Hypothesis 7 was supported.

Social cohesion. Hypothesis 8 proposed that teams with higher levels of social cohesion will perform better on the majority of objective performance criteria, have higher team member satisfaction ratings, and receive higher team performance ratings than teams with lower levels of social cohesion. Results in Tables 11 through 13 indicate that social cohesion was not associated with team leadership problem solving 1 ($t = .39$, ns), computer simulation exercise ($t = -16$, ns), or field operations performance 2 and 3 (t values were –.74 and .06, respectively, both non-significant). Moreover, teams with higher mean levels of social cohesion performed worse in team leadership

problem solving 2 ($t = -1.76$, $p < .05$; see Table 11), physical task exercise ($t = -1.86$, $p < .05$; see Table 12), and field operations performance 1 ($t = -1.63$, $p < .10$; see Table 13) than teams with lower mean levels of social cohesion. On the subjective criteria, teams with higher mean levels of social cohesion had higher team member satisfaction ratings than teams with lower team levels of social cohesion ($t = 5.04$, $p < .001$; see Table 9). On the other hand, there was no association between teams with higher mean levels of social cohesion and team performance ratings ($t = -.49$, ns; see Table 9). Thus, Hypothesis 8 was partially supported.

A usefulness analysis was accomplished for the purpose of determining whether the group process variables, i.e., group potency or social cohesion, explained unique variance in the objective and subjective criteria. Following Weaver, Trevino, and Cochran (1999), a usefulness analysis was performed by alternating the order in which social cohesion and group potency were entered into the models. Control variables were entered into the model in step 1. The next step was to add the goal orientation variables, followed by the personality variables. The order of these three steps remained the same throughout the usefulness analysis. The next step was to enter social cohesion into the models followed by group potency. Then, the entry order of social cohesion and group potency was reversed. The results presented in Table 14 indicated that group potency explained unique variance over and above social cohesion in 5 of the 7 objective performance criteria (team leadership problem solving 2, computer simulation exercise, physical task exercise, and FOP 1 and 2) and both of the subjective

Table 14

Results of Usefulness Analysis for Social Cohesion and Group Potency (time 2) Predictor Variables[a]

Criteria	Variance (%) explained by social cohesion beyond that explained by group potency	Variance (%) explained by group potency beyond that explained by social cohesion	R^2
Objective:			
Team leadership problem solving 1	.00	.02	.23*
Team leadership problem solving 2	.03*	.07*	.22†
Computer simulation exercise	.00	.04*	.24*
Physical task exercise	.03*	.16	.34***
Field operations performance 1	.02	.14***	.40***
Field operations performance 2	.01	.05*	.21†
Field operations performance 3	.00	.00	.12
Subjective:			
Team member satisfaction ratings	.09***	.02*	.73***
Team performance ratings	.00	.17***	.57***

[a] Statistics presented in the table provide the incremental change in R^2 that a given predictor variable accounted for (independent of what all other predictor and control variables accounted for) and the significance of that incremental change in R^2.

[b] Model includes control variables.

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$

performance criteria (team performance ratings and team member satisfaction). Moreover, social cohesion explained unique variance in 2 of the 7 objective performance criteria (team leadership problem solving 2 and physical task exercise) and also explained unique variance in the team member satisfaction criterion.

Social cohesion mediating agreeableness and team member satisfaction relationship. Hypothesis 9 proposed that social cohesion would mediate the relationship between mean levels of team agreeableness and team member satisfaction ratings. To test this mediation hypothesis, the three-step procedure recommended by Baron and Kenny (1986) was used. In step 1, when the mediator variable (social cohesion) is regressed on the independent variable (agreeableness), the independent variable relationship should be statistically significant. In step 2, when the criterion variable (team member satisfaction) is regressed on the independent variable, the independent variable relationship should be statistically significant. In step 3, the criterion variable is regressed on both the mediator variable and the independent variable. In this step, the mediator variable relationship should be statistically significant, and the independent variable relationship should be non-significant for full mediation to exist. The results of the mediation analysis are presented in Table 15.

In step 1 of the mediation procedure, the independent variable (agreeableness) was statistically significant ($t = 1.80$, $p < .05$) when the mediator variable (social cohesion) was regressed on the independent variable. Step 2 of the mediation procedure showed that the independent variable (agreeableness) was statistically significant ($t =$

Table 15

Regression Results for Testing Whether Social Cohesion Mediates the Relationship Between Personality (Agreeableness, Extraversion, and Emotional Stability) and Team Member Satisfaction

Model (criterion variable)	R^2	b[a]	t
Agreeableness model 1 (social cohesion)	.04	.18	1.80*
Agreeableness model 2 (team member satisfaction)	.04	.19	1.81*
Agreeableness model 3 (team member satisfaction)	.67		
Social cohesion		.81	13.05***
Agreeableness		.04	.59
Extraversion model 1 (social cohesion)	.03	.17	1.65*
Extraversion model 2 (team member satisfaction)	.01	.07	.69
Extraversion model 3 (team member satisfaction)	.67		
Social cohesion		.91	19.03***
Extraversion		-.08	-1.75*

Note. N = 92 teams.

[a] Standardized beta weights.

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

1.81, $p < .05$) when the criterion variable (team member satisfaction) was regressed on agreeableness. In step 3, the criterion variable (team member satisfaction) was regressed on both the independent variable (agreeableness) and the mediator variable (social cohesion). Results summarized in Table 15 reveal that when both agreeableness and social cohesion were in the model, social cohesion was statistically significant ($t = 13.05$, $p < .001$) and agreeableness was non-significant ($t = .59$, ns). Thus, full mediation existed, and Hypothesis 9 was supported.

Social cohesion mediating extraversion and team member satisfaction relationship. As summarized in the previous analysis, Hypothesis 9a predicted that social cohesion would mediate the relationship of extraversion (mean) with the criterion of team member satisfaction. The three-step mediation analysis procedure recommended by Baron and Kenny (1986) was again used to test Hypothesis 9a. In step 1 of the mediation analysis, the independent variable (extraversion) was statistically significant ($t = 1.65$, $p < .05$), thus meeting the first requirement of the mediation procedure. In step 2 of the procedure, the criterion variable (team member satisfaction) was regressed on the independent variable (extraversion). As can be seen in Table 15, the independent variable was non-significant ($t = .69$, ns), thus failing step 2. Hypothesis 9a was not supported.

Table 16 summarizes the results of the hypotheses testing. As Table 16 shows, 2 of the 13 hypotheses were supported, 3 were partially supported, and the remaining 8 were not supported.

Table 16

Summary of Hypotheses Tests Results

	Hypothesis	Result	Specific Finding
1	Teams with higher mean levels of conscientiousness will perform better on a majority of objective performance tasks and receive higher ratings of team performance than teams with lower mean levels of conscientiousness.	Not supported	No relationship found between mean team conscientiousness and team performance on objective tasks or team performance ratings.
2	Teams with higher mean levels of extraversion will have higher team member satisfaction ratings than teams with lower mean levels of extraversion.	Not supported	No relationship found between mean team extraversion and ratings of team member satisfaction.
2a	Teams with higher variance in team member scores on extraversion will have higher team member satisfaction ratings than teams with lower variance in team member scores on extraversion.	Not supported	No relationship found between variance in team extraversion and ratings of team member satisfaction.
3	Teams with higher mean levels of agreeableness will perform better on a majority of objective performance tasks, receive higher team performance ratings, and have higher team member satisfaction ratings than teams with lower mean levels of agreeableness.	Not supported	No relationship found between mean team agreeableness and team performance on objective tasks or team performance ratings.
4	Teams with higher mean levels of emotional stability will perform better on a majority of objective performance tasks and have higher team member satisfaction ratings than teams with lower mean levels of emotional stability.	Partially supported	Relationship found between mean team emotional stability and team performance on 1 objective task (computer simulation). No relationship found between mean emotional stability and ratings of team member satisfaction.
4a	Teams with higher variance in team member scores on emotional stability will have higher team member satisfaction ratings than teams with lower variance in team member scores on emotional stability.	Not supported	Negative relationship found between variance in team emotional stability and ratings of team member satisfaction.

Table16 (continued)

Summary of Hypotheses Tests Results

	Hypothesis	Result	Specific Finding
5	Teams with higher mean levels of openness to experience will perform better on a majority of objective performance tasks and receive higher team performance ratings than teams with lower mean levels of openness to experience.	Not supported	Negative relationship found between mean team openness to experience and field operations performance 1. No other relationship found between mean team openness to experience and performance of objective tasks or team performance ratings.
6	Teams with higher mean levels of learning goal orientation will perform better on a majority of objective performance tasks than teams with lower mean levels of learning goal orientation.	Not supported	No relationship found between mean team learning goal orientation and performance on majority of objective tasks.
6a	Teams with higher mean levels of performance goal orientation will perform worse on a majority of objective performance tasks than teams with lower mean levels of performance goal orientation.	Partially supported	Negative relationship found between mean team performance goal orientation and two objective performance tasks (TLPS 2 and FOP 1); no relationship found with performance of other objective tasks.
7	Teams with higher mean levels of group potency will perform better on the majority of objective performance tasks, have higher team member satisfaction ratings, and receive higher team performance ratings than teams with lower mean levels of group potency.	Supported	Relationships found with group potency and both subjective performance measures and performance on 6 of 7 objective tasks.

Table16 (continued)

Summary of Hypotheses Tests Results

	Hypothesis	Result	Specific Finding
8	Teams with higher mean levels of social cohesion will perform better on the majority of objective performance tasks, have higher team member satisfaction ratings, and receive higher team performance ratings than teams with lower mean levels of social cohesion.	Partially supported	Negative relationship found between mean team social cohesion and performance with 3 of 7 objective tasks. Relationship found between mean team social cohesion and ratings of team member satisfaction. No relationship found with team performance ratings.
9	Social cohesion will mediate the relationship between agreeableness (mean) and team member satisfaction.	Supported	Social cohesion mediated relationship between mean team agreeableness and ratings of team member satisfaction.
9a	Social cohesion will mediate the relationship between extraversion (mean) and team member satisfaction.	Not Supported	Social cohesion did not mediate the relationship between mean team extraversion and ratings of team member satisfaction.

Supplemental Analyses

Additional analyses were performed with group potency (time 1) to further understand the impact of group potency (time 2). Because of organizational constraints, respondents were allowed to be surveyed only in weeks 1 and 5 of the class. Although no teams knew the final results relative to other teams, some teams might have had some idea of their teams' final standings by week 5. A question might be raised regarding the extent to which knowledge of the team performance results might have affected the responses on group potency (time 2). In trying to understand the true nature of group potency as a predictor variable, group potency was also measured in week 1 to establish a baseline and to assess the efficacy of group potency as a team process variable in predicting team performance. If group potency (time 1) also showed predictive ability, more weight could be given to the results of group potency (time 2) because teams did not know team performance results in week 1. Group potency (assessed at time 1) was tested for each of the objective performance criteria and both of the subjective criteria. Each model consisted of 3 steps. First, the control variables were entered into the model. In step 2, the input variables were entered into the model. Finally, in step 3, group potency (time 1) was entered into the model.

Group potency showed predictive ability with the subjective criteria. Teams with higher mean levels of group potency at time 1 received higher team performance ratings ($t = 3.88$, $p < .001$) and had higher team member satisfaction ratings ($t = 2.28$, $p < .05$; see Table 17). Additionally, an intercorrelation revealed that group potency (time 1) was related with group potency (time 2, $r = .43$, $p < .01$) and social cohesion ($r = .26$,

$p < .01$). Group potency (time 1) was not significantly related with any of the objective performance criteria (see Table 17).

Table 17

Hierarchical Regression Analysis of Control, Input, and Group Potency (time 1) with Subjective and Objective Performance Criteria

	Subjective performance criteria		Objective performance criteria						
Variable	Team performance rating	Team member satisfaction	Team leadership problem solving 1	Team leadership problem solving 2	Computer simulation exercise	Physical task exercise	Field operations performance 1	Field operations performance 2	Field operations performance 3
Group potency (time 1) beta weight	.68	.27	-.03	.14	.10	.13	.08	.27	.02
Group potency (time 1) t-value	3.88***	2.28*	-.27	1.10	.76	1.01	.62	2.16*	.12
Overall model F	2.25*	1.85†	1.18	1.35	1.21	.83	1.35	1.45	.81
Total R^2	.24	.20	.14	.16	.14	.10	.16	.17	.10

Note. Overall model F and R^2 represent values after control and input variables have been added into the models.

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

IV. DISCUSSION

The major purpose of the present study was to investigate the relationship between both team composition (individual difference) and team process variables and team performance. Recent events reveal the consequences of team failure or success and underscore why it is important to study the various aspects of teams and what contributes to team success. Several incidents over the past year have highlighted the importance of teams. First, a Navy submarine performing maneuvers in violation of operating instruction, and a breakdown in some aspect of team functioning resulted in the death of 19 Japanese sailors as the submarine rammed a Japanese vessel during surfacing operations by the submarine (Munsey, 2001). Second, an EP-3 reconnaissance aircraft was forced into recovery maneuvers when it accidentally collided with a Chinese fighter aircraft. In stark contrast to the submarine incident just described, several members of the EP-3 crew stated that the crew's teamwork during the crisis was what got them through the ordeal (Brown, 2001). These examples emphasize the possible consequences of teamwork and processes and highlight the real-world implications of the functioning of teams and the resultant outcomes.

The current study examined the relationship between team performance in self-managing teams and attributes of team members including personality (Big Five), goal orientation, and team processes (social cohesion and group potency) aggregated to the team level. Team performance was measured using several different criteria. Objective

performance was assessed with 7 objective performance criteria collected on each team over a 5-week period. Subjective performance was assessed by the commander of each team, and ratings of team member satisfaction were provided by team members. Hierarchical regression was the primary statistical procedure used to test the study's hypotheses (Hypotheses 1 through 8). Baron and Kenney's (1986) 3-step procedure was used to test for possible mediation effects for Hypotheses 9 and 9a.

Summary of Findings

In general, the findings of this study indicated that group potency continues to be a strong group variable in predicting both objective and subjective team performance measures (Campion et al., 1993; Campion et al., 1996; Jordan et al., 2001). In a series of two studies, Campion (1993; 1996) and his colleagues investigated teams (80 and 60 teams, respectively) using employees from a financial services group. In both studies, Campion and colleagues, based on the literature, derived five common themes (job design, interdependence, composition, context, and process) of effective groups. They then identified characteristics for each theme which were then tested for relationships with three different effectiveness criteria. Both studies conceptualized, as did this study, group potency as a process variable. Moreover, group potency was found to be related to productivity, employee satisfaction, and manager judgments (Campion et al., 1993) as well as employee satisfaction, employee judgments, and manager judgments (Campion et al., 1996).

Jordan et al. (2001) studied a sample of military officers in a prior school year at the same school as the one examined in the current study. They also reported a strong

relationship between group potency and both objective criteria (physical and mental task exercises) and subjective criteria (team performance ratings by the commander).

As anticipated, social cohesion was predictive of team performance and, further, was shown to mediate the relationship between team mean levels of agreeableness and ratings of team member satisfaction. With few exceptions, the dispositional variables investigated in the current study, aggregated to the team level, generally did not relate to either objective or subjective team performance.

Specific Findings

Personality variables. Teams with higher mean levels of conscientiousness were expected to perform better on a majority of objective performance tasks and receive higher team performance ratings than teams with lower conscientiousness levels (Hypothesis 1). However, none of the tested relationships were significant. Previous research offers a possible explanation for these unanticipated findings. Robertson, Baron, Gibbons, MacIver, and Nyfield (2000), in a study of 453 managers from a variety of industries, argued that some of the dispositional qualities associated with high conscientiousness (i.e., organized, conforming, reliable, detail conscious, and purposeful) are opposite of what might be needed in an environment where different qualities are needed, such as creativity and a willingness to do things differently. Robertson et al. went on to argue that the increased flexibility and the readiness to change required in some managerial positions indicate that some characteristics associated with high conscientiousness may ". . . serve to undermine certain aspects of managerial performance" (p. 173). Whereas, many of the tasks in the current study

could not be categorized as managerial, the dynamic nature of the planning and execution of the tasks were such that teams were often required to modify, adapt, and change their plans to increase their chances of success.

The role of extraversion in team performance was the focus of Hypotheses 2 and 2a. Hypothesis 2 predicted that teams with higher mean levels of extraversion would have higher ratings of team member satisfaction than teams with lower mean levels of extraversion. Hypothesis 2a predicted that teams with higher variance in team member scores on extraversion would have higher team member satisfaction than teams with lower variance in their extraversion scores. Counter to Hypothesis 2, there was no relationship between the level of average team extraversion and team member satisfaction. Moreover, counter to Hypothesis 2a, the data showed no relationship between the variance in extraversion and ratings of team member satisfaction. All team members in the current study were expected to participate in problem-solving sessions by talking and making inputs and were subsequently assessed to some degree by their peers on their level of participation. This suggests that differences in team extraversion variance would have been more difficult to detect. Therefore, the lack of findings for Hypothesis 2a are not surprising.

Teams with higher mean levels of agreeableness, contrary to predictions, did not perform better on a majority of the objective performance criteria, have higher team performance ratings, or receive higher ratings of team member satisfaction (Hypothesis 3). In fact, agreeableness was negatively related to two of the objective performance criteria (computer simulation exercise and field operations performance 1). Antonioni

(1998), in a study of 351 students and 110 managers, found that agreeableness was positively associated with a management style characterized by compromising and avoiding. Specifically, Antonioni suggested that individuals high in agreeableness tend to defer to others or totally avoid possible conflict in team situations. Similarly, in a study of 276 individuals in a laboratory setting, LePine and Van Dyne (2001) identified a negative relationship between individuals high in agreeableness and voice, which is defined as "speaking out and challenging the status quo with the intent of improving the situation" (LePine & Van Dyne, 1998, p. 853). In the present study, many of the team performance tasks were time sensitive, which put pressure on the teams to plan and execute effectively and efficiently. Teams with higher mean levels of agreeableness might have tended to defer the planning and organizing to the more vocal members of the team. These more vocal members might not have been the individuals who had the appropriate abilities or experience to successfully plan for and solve the problem. Therefore, teams with higher mean levels of agreeableness, because of poor use of personnel resources were not as successful as they might otherwise have been.

Hypothesis 4 predicted that teams with higher mean levels of emotional stability would perform better on a majority of objective tasks and have higher team member satisfaction ratings than teams with lower mean levels of emotional stability. This hypothesis was partially supported in that teams with higher mean levels of emotional stability performed better on the computer simulation exercise, although there was no association with team member satisfaction ratings. LePine and Van Dyne (2001) reasoned that individuals who are emotionally stable have higher self-worth, believe

they can influence the situation, and do not feel helpless. For these reasons, emotionally stable team members are proactive about making suggestions for change. LePine and Van Dyne found in their study that individuals who are emotionally stable were more likely to exhibit voice behavior. In the context of the computer simulation exercise, the situation is constantly changing depending on the computer responses to team inputs. The proactive and flexible nature of the emotionally stable individual matches well with the dynamic nature of the computer simulation exercise. Therefore, teams with higher mean levels of emotional stability would be more willing to change and adapt plans during the computer simulation exercise than would be a team with lower mean levels of emotional stability.

A competing Hypothesis (4a) was that teams with higher variance in team member scores on emotional stability would have higher team member satisfaction ratings than teams with lower variance in team member scores on emotional stability. This hypothesis was not supported in that there was no association between the variance in teams' emotional stability and team member satisfaction ratings.

Hypothesis 5, positing that teams with higher mean levels of openness to experience would perform better on a majority of objective performance tasks and receive higher team performance ratings than teams with lower mean levels of openness to experience, was also not supported. Teams with higher mean levels of openness to experience actually received worse team performance ratings by their team commanders and performed worse in a field operations exercise than teams with lower mean levels of openness to experience. The openness to experience results are contrary to what was

expected and are puzzling. One possible explanation for this finding could be that early in the team development process, teams with higher mean levels of openness to experience (being curious, creative, cultured, original, broad-minded, changing the status quo, and intelligent; Salgado, 1997), may have tended to over-analyze obvious solutions to tasks. Because individuals who are high in openness to new experiences are curious and creative (Barrick & Mount, 1991), they might not have been as focused on completing the task or as focused on the needs of the team resulting in lowered team performance. Also, it could be argued that because of their curious and creative nature, they might have been more willing to take risks and try creative or novel solutions to the tasks assigned to the team, thus hindering the team's overall performance. The nature of the field operations performance is such that FOP 1 relies on the teams to know the rules and fundamentals of the task or the likelihood of failure on the task is increased. The experience of participating in FOP 1 gives the teams a good idea of the basic requirements necessary to compete in future FOP exercises (i.e., FOP 2 and FOP 3). Therefore, the characteristics of an openness-to-experience team would be less likely to hinder future FOP performance.

Goal orientation as a dispositional variable. Hypothesis 6 proposed that teams with higher mean levels of learning goal orientation would perform better on a majority of objective performance tasks than teams with lower mean levels of learning goal orientation. This hypothesis was not supported. Learning goal orientation, much like conscientiousness, is a trait that should combine additively in that the more team members with this trait are on the team, the better the team performance. A greater

learning goal orientation should lead to increased effort and persistence by team members with the goal of improving abilities. Additionally, when faced with a challenging task, individuals with high learning orientation would be expected to engage in more solution-oriented self-instruction. However, the results did not suggest better team performance from teams with higher mean levels of learning goal orientation. Like conscientiousness, one possible explanation for the lack of results with learning goal orientation was that team members with a learning goal orientation had to perform not only their tasks, but also had to perform, or redo, the tasks of the performance goal oriented team members. Another possible reason for the non-significant results might have involved short-term team performance success versus long-term team performance success. For instance, Kohli et al. (1998), in a study of salespersons from two Fortune 500 companies, also found no relationship between learning goal orientation and performance. They speculated that learning goal orientation might be more related to long-term performance because individuals with a learning goal orientation attempt difficult tasks with the belief that they are improving their ability, thus preparing them for more difficult tasks in the future. The teams in the current study were engaged in short-term (five weeks) performance which may account for the absence of a relationship between learning goal orientation and team performance.

Teams with higher mean levels of performance goal orientation performed worse in team leadership problem solving 2 than teams with higher mean levels of performance goal orientation, thus Hypothesis 6a was partially supported. No

relationship was found between performance goal orientation and five of the remaining six objective performance tasks, thus supporting prior research that suggests performance goal orientation is negatively related to, or has no relation with performance (Colquitt & Simmering, 1998; VandeWalle et al., 1999). In VandeWalle et al.'s study, performance goal orientation was unrelated to level of intended effort and level of intended planning. Ability is viewed by performance goal oriented individuals as fixed, and thus, they view high effort as ". . . an indicator of low ability because they reason that a capable person would not need to try so hard to accomplish a task" (VandeWalle et al., 1999, p. 251). Additionally, VandeWalle et al. reasoned that performance goal-oriented individuals were less likely than learning goal-oriented individuals to put forth the effort to commit themselves to planning for performance success. Moreover, it has been suggested that the higher one's performance goal orientation, the greater chance an individual would react to a difficult task with doubts about his or her ability levels (Elliott & Dweck, 1988). For these reasons, the lack of findings with regard to teams with high levels of performance goal orientation is not surprising.

Group potency. Hypothesis 7 predicted that teams with higher mean levels of group potency would perform better on the majority of objective performance tasks, receive higher team performance ratings, and have higher ratings of team member satisfaction than teams with lower mean levels of group potency. Consistent with prior findings (Campion et al., 1993; Campion et al., 1996; Guzzo et al., 1993; Shea & Guzzo, 1987), the results indicated that group potency was related to 6 of the 7

objective performance tasks. This finding is consistent with other research that reported a positive relationship between teams with higher mean levels of group potency and performance on objective measures (Hecht, Allen, Klammer, & Kelly, 2000; Jordan et al., 2001).

Results also revealed that group potency was positively related to both subjective criteria (team performance ratings and ratings of team member satisfaction). This finding is also consistent with prior research (Campion et al., 1993, 1996). These researchers, in a study of work groups in a financial company concluded that mean levels of group potency were related to both team member satisfaction and managerial ratings of work group effectiveness. The relationship between teams with higher mean levels of group potency and several components of team effectiveness (objective performance measures, team performance ratings, and ratings of team member satisfaction) support the notion that group potency is an important variable in explaining team success.

Why is group potency such a strong predictor of performance? The belief that the team can be effective across several tasks partially depends on if members believe the team has what it needs to succeed—training, skills, talented members, time, and feedback about group performance (Shea & Guzzo, 1987). Shea and Guzzo also surmised that " . . . if the group received positive feedback about performance to date, it tends to believe it can be effective henceforth" (p. 26). As a team has success in tasks, group potency increases and increases the probability of future success. Finally, it is

not surprising that a team with success on objective tasks would receive high team performance ratings and have satisfied members.

Social cohesion. Teams with higher mean levels of social cohesion were predicted to perform better on the majority of objective performance tasks, receive higher team performance ratings, and have higher ratings for team member satisfaction (Hypothesis 8). This hypothesis was partially supported. Teams with higher mean levels of social cohesion had higher ratings of team member satisfaction than teams with lower levels of social cohesion. It is also important to note that when the hierarchical regression tests were run without group potency in the model, teams with higher mean levels of social cohesion also performed better on the majority of objective performance tasks and received higher team performance ratings than teams with lower mean levels of social cohesion. This suggests that social cohesion is also an important group process variable and may become more predictive of group performance over time. In a recent meta-analysis, stronger cohesiveness to performance effects were found in real teams (teams that interact on multiple occasions and result in longer and deeper experiences for team members) and smaller teams (Mullen & Copper, 1994). Both of these could have played a role in social cohesion not displaying as strong a relationship with performance as group potency. Team size in this study ranged from 10 to 13 members with 51% of the teams having 13 members. Additionally, although the teams in this study were not ad hoc teams, they also were not mature teams in an on-going organization.

Mediation hypotheses. The mediation analyses suggested that one of the personality dimensions (agreeableness; mean operationalization) was indirectly related to team member satisfaction through the mediating variable of social cohesion (Hypothesis 9). Hence, teams with higher mean levels of agreeableness were more likely to be a cohesive team, which, in turn, led to higher ratings of team member satisfaction. On the other hand, extraversion (mean) had no indirect or direct relationship with team member satisfaction. Consequently, Hypothesis 9a was not supported.

Implications

Several implications emerge from the current study. First, group potency continues to display strong predictive ability in a team context (cf. Campion et al., 1993; Campion et al., 1996; Jordan et al., 2001). The results point to the value of group potency as an important team process variable in predicting team effectiveness criteria. Using teams in a realistic training environment and examining practical team effectiveness criteria, group potency emerged as the group process variable that explained unique variance in six of the seven objective team performance criteria and both subjective criteria (team performance ratings and ratings of team member satisfaction). Thus, the current study reinforces that group potency is an important variable to consider when studying team effectiveness. Several practical suggestions for team leaders and managers are prompted by the findings of this study. First, attention should be given to ensuring team success early in the team development process since research indicates that early team success leads to higher group potency

(Lester, 1991; Sosik, Avolio, & Kahai, 1997), which, in turn, leads to higher future team performance. For instance, Guzzo et al. (1993) argued that team effectiveness had an important influence on group potency. Moreover, in a longitudinal study using 36 work groups, Sosik et al. (1997) noted that group potency (at time 1) was related to performance, which was then related to group potency (at time 2). Hence, team success leads to higher group potency, which then leads to more team success. Second, emphasis by a leader on the antecedents to group potency has the potential of increasing group potency and, in turn, team performance. For instance, establishing a team structure that emphasizes effective and ample communication and cooperation, both antecedents of group potency (Lester, 1991), early in the team development process can have positive effects on team performance. Other antecedents of group potency (Guzzo et al., 1993) deserving study in future research are (a) the presence of challenging group goals, (b) group members' perceptions of the group's potential to contribute to the goals of a larger social system, (c) group size, and (d) the leadership style of the team leader (Lester, 1991).

Second, group potency predicted several different types of team performance. For instance, group potency was not only predictive of objective performance tasks, but it was also predictive of supervisor team performance ratings and ratings of team member satisfaction. Hence, a team that collectively believes it can be successful across several tasks, might perform better on objective tasks, might receive higher supervisory ratings for team performance, and the members of the team might be more satisfied than teams with lower group potency.

Finally, supplemental analyses revealed that teams with higher mean levels of group potency (administered at time 1) received higher team performance ratings and ratings of team member satisfaction, although teams with higher mean levels of group potency (time 1) did not predict the team's performance on objective criteria. Thus, it appeared that supervisors who were exposed to teams in week 1 that collectively believed their team could be effective across tasks, rated those teams higher at the end of week 5, even though those teams did not perform better on objective tasks. The belief by team members that their teams could be effective across tasks, most likely was evidenced in team feedback sessions in week one following several team building exercises. Hence, it appeared the supervisors of the teams were unduly influenced by the teams' belief in week one that the team could be successful across multiple tasks.

Possible Issues Affecting Research Results

Several possible explanations for the lack of findings with regard to the dispositional variables in this research exist. The first is team size. Team size in this sample was determined by the requirements of the organization where the data were collected. Research indicates a negative relationship between team size and performance (Mullen & Baumeister, 1987; Mullen, Johnson, & Drake, 1987). Furthermore, Morgan, Coates, and Rebbin (1970), in a study of crew members, found that when one of the five crew members was absent, the performance of the team increased. Whereas, bigger teams can process more information and bring more expertise to the team, an increase in team size can increase the interdependencies between team members and coordination can become more difficult (Bass, 1982). The

literature does not seem to indicate at what point a negative relationship begins to occur in relation to team size, however, the literature does provide suggestions for optimal team size. For instance, several authors have suggested that teams should consist of no more than five or six members when performing problem-solving tasks (Bass, 1982; Sweezey & Salas, 1992). The teams in this study were 10 to 13 members with a majority of teams having 13 members. This may help to explain the general lack of positive relationships between the team aggregated dispositional variables and team performance in this study but does not explain the instances of no relationships with performance.

Second, the sample for this study ($\underline{N}$ = 92 teams), while larger than most team-based studies, was less than optimum. Small sample sizes are a common limitation plaguing team-based research studies (cf., Barrick et al., 1998; Lepine et al., 1997) and could have contributed to lack of support for some of the hypotheses. The sample size in this study prompted an examination of the statistical power of the statistical tests used in testing the study hypotheses. With the exception of group potency, the statistical power of the analyses in this study was low ranging from .12 to .36 for the other independent variables. Statistical power for group potency, on the other hand, was .73 across all of the nine criteria. However, in spite of low statistical power for some analyses, full support was found for two of the 13 hypotheses and partial support found for three others.

A third issue, related to group potency instead of the dispositional variables, was the limitations placed on the researcher by the sponsoring organization limiting survey

administration to weeks 1 and 5. It could be argued that collection of the group potency data in week 5 might have influenced some of the responses because teams might have had an idea of the team results in week 5. Supplemental analyses were conducted to address this issue. Group potency (administered at time 1) was tested in the hierarchical regression models in place of group potency (time 2) to determine if significant results would occur with group potency at time 1. The results showed that group potency (time 1) also predicted both subjective criteria (team performance ratings and ratings of team member satisfaction). Thus, the true efficacy of group potency likely falls somewhere between the reported results for group potency (time 1) and those for group potency (time 2). So, group potency still appears to be an important variable in predicting team performance.

Strengths of the Research Study

Several contributions of the current study deserve mention. First, the study was performed in a field setting. Because of the difficulty of assessing teams in actual organizational settings, much team research is performed using students in laboratory settings (cf. Barry & Stewart, 1997; LePine et al., 1997). The respondents in the current study were placed in a team environment and were evaluated in much the same way they are evaluated in their jobs. Each respondent received a training report that was entered into their permanent record to be used in future promotion and assignment decisions. Second, the practicality of the team effectiveness criteria enhanced the importance of this study. Each of the tasks in which the teams participated, was objectively measured using maximum performance as a measured outcome. Maximum

participation was expected in each team, and based on the way in which the criteria were developed, increased the likelihood of high performance by teams. Additionally, a supervisor was asked to rate team performance using a measure developed as a result of inputs from subject matter experts. Moreover, team members were asked to rate the level of their satisfaction. The combination of these diverse team effectiveness criteria strengthened the external validity of the results reported in this study. Finally, the response rate in the study was extremely high. Of the 1,158 possible respondents, 1,130 (98%) completed surveys at both time 1 and time 2. Additionally, the surveys given to the supervisors were completed by all 92 supervisors for a 100% response rate.

Directions for Future Research

This study should be replicated with smaller teams. As indicated earlier, team size might have contributed to the lack of findings with the dispositional variables. Smaller teams would help guard against possible social loafing and free riding effects and give a truer representation of the effectiveness of aggregating dispositional variables to the team level to determine predictive ability on team performance. Second, future studies should examine teams in an operational environment. Studying teams in an operational environment allows one to avoid several of the limitations in the current study. Team viability becomes an important team effectiveness variable to measure because the possibility of the team continuing as a team, exists. Finally, the current study should be replicated with teams that remain together for longer periods of time. Social cohesion—"a general indicator of synergistic group interaction or process"

(Barrick et al., 1998, p. 382) might become a more powerful process variable if teams are given more time to develop as a group.

Summary and Conclusion

In summary, the purpose of this study was to address the shortfall of research (testing non-demographic team composition variables, group process variables and their relationship with team effectiveness) identified by Barrick et al. (1998). Additionally, the input-process-outcome (I-P-O) framework, initially developed by McGrath (1964) and later modified and used by Hackman (1987, 1990), was used as a guide. The findings indicate that group potency and social cohesion, to a lesser extent, were valid predictors of two of Hackman's (1987, 1990) components of team effectiveness (output criteria and team member satisfaction). With a few exceptions, the dispositional variables aggregated to the team level were generally not predictive of team effectiveness.

REFERENCES

Antonioni, D. (1998). Relationship between the Big Five personality factors and conflict management styles. International Journal of Conflict Management, 9, 336.355.

Ancona, D. G., & Caldwell, D. F. (1992). Demography and design: Predictors of new product team performance. Organization Science, 3, 321-341.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. Journal of Personality and Social Psychology, 51, 1173-1182.

Barrett, L. F., & Pietromonaco, P. R. (1997). Accuracy of the five-factor model in predicting perceptions of daily social interactions. Personality and Social Psychology Bulletin, 23, 1173-1187.

Barrick, M. R., & Mount, M. K. (1991). The Big Five personality dimensions and job performance: A meta-analysis. Personnel Psychology, 44, 1-26.

Barrick, M. R., Mount, M. K., & Strauss, J. P. (1993). Conscientiousness and performance of sales representatives: Test of the mediating effects of goal setting. Journal of Applied Psychology, 78, 715-722.

Barrick, M. R., Stewart, G. L., Neubert, M. J., & Mount, M. K. (1998). Relating member ability and personality to work-team processes and team effectiveness. Journal of Applied Psychology, 83, 377-391.

Barry, B., & Stewart, G. L. (1997). Composition, process, and performance in self-managed groups: The role of personality. Journal of Applied Psychology, 82, 62-78.

Bass, B. M. (1982). Intensity of relation, dyadic-group considerations, cognitive categorization, and transformational leadership. In J. G. Hunt, U. Sekaran, & C. A. Schriesheim (Eds.), Leadership beyond establishment views. Carbondale: Southern Illinois University Press.

Baugh, S. G., & Graen, G. B. (1997). Effects of team gender and racial composition on perceptions of team performance in cross-functional teams. Group & Organization Management, 22, 366-383.

Benton, J. C. (1999). Air force officer's guide (32nd ed.). Mechanicsburg, PA: Stackpole Books.

Bishop, J. W., & Scott, K. D. (2000). An examination of organizational and team commitment in a self-directed team environment. Journal of Applied Psychology, 85, 439-450.

Bonner, B. L. (2000). The effects of extroversion on influence in ambiguous group tasks. Small Group Research, 31, 225-244.

Brett, J. F., & VandeWalle, D. (1999). Goal orientation and goal content as predictors of performance in a training program. Journal of Applied Psychology, 84, 863-873.

Brown, D. (2001, April 16). First—a jolt, then a crisis. Navy Times, pp. 8-12.

Button, S., Mathieu, J., & Zajac, D. (1996). Goal orientation in organizational behavior research: A conceptual and empirical foundation. Organizational Behavior and Human Decision Processes, 67, 26-48.

Caldwell, D. F., & Burger, J. M. (1998). Personality characteristics of job applicants and success in screening interviews. Personnel Psychology, 51, 119-136.

Caligiuri, P. M. (2000). The Big Five personality characteristics as predictors of expatriate's desire to terminate the assignment and supervisor-rated performance. Personnel Psychology, 53, 67-88.

Campion, M. A., Medsker, G. J., & Higgs, A. C. (1993). Relations between work group characteristics and effectiveness: Implications for designing effective work groups. Personnel Psychology, 46, 823-850.

Campion, M. A., Papper, E. M., & Medsker, G. J. (1996). Relations between work team characteristics and effectiveness: A replication and extension. Personnel Psychology, 49, 429-452.

Carter, L., Haythorn, W., & Howell, M. (1950). A further investigation of the criteria of leadership. Journal of Abnormal and Social Psychology, 45, 350-358.

Cattell, R. B. (1951). New concepts for measuring leadership, in terms of group syntality. Human Relations, 4, 161-184.

Colquitt, J. A., & Simmering, M. J. (1998). Conscientiousness, goal orientation, and motivation to learn during the learning process: A longitudinal study. Journal of Applied Psychology, 83, 654-665.

Costa, P. T., Jr., & McCrae, R. R. (1992). Revised NEO-Personality Inventory (NEO PI-R) and NEO Five-Factor Inventory (NEO-FFI) professional manual. Odessa, FL: Psychological Assessment Resources.

Costa, P. T., Jr., & McCrae, R. R. (1995). Solid ground in the wetlands of personality: A reply to Block. Psychological Bulletin, 117, 216-220.

DeStephen, R. S., & Hirokawa, R. Y. (1988). Small group consensus: Stability of group support of the decision, task process, and group relationships. Small Group Behavior, 19, 227-239.

Digman, J. M. (1990). Personality structure: Emergence of the five-factor model. Annual Review of Psychology, 41, 417-440.

Driskell, J. E., Hogan, R., & Salas, E. (1988). Personality and group performance. In C. Hendricks (Eds.), Review of personality and social psychology: Vol. 9. Group processes and intergroup relations (pp. 91-112). Newbury Park, NJ: Sage Publications.

Dweck, C. S. (1975). The role of expectations and attributions in the alleviation of learned helplessness. Journal of Personality and Social Psychology, 31, 674-685.

Dweck, C. S. (1986). Motivational processes affecting learning. American Psychologist, 41, 1040-1048.

Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. Psychological Review, 95, 256-273.

Elliott, E. S., & Dweck, C. S. (1988). Goals: An approach to motivation and achievement. Journal of Personality and Social Psychology, 54, 5-12.

Evans, C. R., & Dion, K. L. (1991). Group cohesion and performance: A meta-analysis. Small Group Research, 22, 175-186.

Evans, N. J., & Jarvis, P. A. (1986). The group attitude scale: A measure of attraction to group. Small Group Behavior, 17, 203-216.

Exline, R. V., Gray, D., & Schuette, D. (1965). Visual behavior in a dyad as affected by interview content and sex of respondent. Journal of Personality and Social Psychology, 1, 201-209.

Eysenck, H. J. (1953). The structure of human personality. London: Methuen.

Eysenck, H. J. (1991). Dimensions of personality: 16, 5, or 3? Criteria for a taxonomic paradigm. Personality and Individual Differences, 12, 773-790.

Eysenck, H. J. (1992). Four ways five factors are not basic. Personality and Individual Differences, 13, 667-673.

Farr, J. L., Hofmann, D. A., & Ringenbach, K. L. (1993). Goal orientation and action control theory: Implications for industrial and organizational psychology. In C. L. Cooper & I. T. Robertson (Eds.), International review of industrial and organizational psychology (pp. 193-232). New York, NY: Wiley.

Fenelon, J. R., & Megargee, E. I. (1971). Influence of race on the manifestation of leadership. Journal of Applied Psychology, 55, 353-358.

Festinger, L. (1950). Informal social communication. Psychological Review, 57, 271-284.

Forsyth, D. R. (1990). Group dynamics (2nd ed.). Pacific Grove, CA: Brooks/ Cole Publishing Company.

George, J. M. (1990). Personality, affect, and behavior in groups. Journal of Applied Psychology, 75, 107-116.

George, J. M., & Bettenhausen, K. (1990). Understanding prosocial behavior, sales performance, and turnover: A group level analysis in a service context. Journal of Applied Psychology, 75, 698-709.

Gibson, C. B., Randel, A. E., & Earley, P. C. (2000). Understanding group efficacy: An empirical test of multiple assessment methods. Group & Organization Management, 21, 67-97.

Gladstein, D. L. (1984). Groups in context: A model of task group effectiveness. Administrative Science Quarterly, 29, 499-517.

Goldberg, L. R. (1992). The development of markers of the Big-Five factor structure. Psychological Assessment, 4, 26-42.

Guzzo, R. A. (1986). Group decision making and group effectiveness in organizations. In P. S. Goodman & Associates (Eds.), Designing effective work groups (pp. 34-71). San Francisco, CA: Jossey-Bass Inc., Publishers.

Guzzo, R. A., & Dickson, M. W. (1996). Teams in organizations: Recent research on performance and effectiveness. Annual Review of Psychology, 47, 307-338.

Guzzo, R. A., & Salas, E. (1995). Team effectiveness and decision making in organizations. San Francisco, CA: Jossey-Bass Publishers.

Guzzo, R. A., & Shea, G. P. (1992). Group performance and intergroup relations in organizations. In M. D. Dunnette & L. M. Hough (Eds.), Handbook of

Industrial and Organizational Psychology, 11, 2nd ed. Palo Alto, CA: Consulting Psychologists Press.

Guzzo, R. A., Yost, P. R., Campbell, R. J., & Shea, G. P. (1993). Potency in groups: Articulating a construct. British Journal of Social Psychology, 32, 87-106.

Hackman, J. R. (1987). The design of work teams. In J. W. Lorsch (Ed.), Handbook of organizational behavior (pp. 376-389). Englewood Cliffs, NJ: Prentice Hall.

Hackman, J. R. (1990). Groups that work (and those that don't). San Francisco, CA: Jossey-Bass Inc., Publishers.

Hackman, J. R., & Morris, C. G. (1975). Group tasks, group interaction process and group performance effectiveness: A review and proposed integration. In L. Berkowitz (Ed.), Advances in experimental social psychology (Vol. 8, pp. 45-99). New York, NY: Academic Press.

Hair, J. F., Jr., Anderson, R. E., Tatham, R. L., & Black, W. C. (1997). Multivariate data analysis. (5th Ed.). Upper Saddle River, NJ: Prentice Hall.

Haythorn, W. W. (1953). The influence of individual members on characteristics of small groups. Journal of Abnormal and Social Psychology, 48, 276-284.

Haythorn, W. W. (1968). The composition of groups: A review of the literature. Acta Psychologica, 28, 97-128.

Hecht, T. D., Allen, N. J., Klammer, J., & Kelly, E. C. (2000). Group Beliefs, Capability, and Performance: The Potency of Group Potency. Paper presented at the

15th annual meeting of the Society for Industrial and Organizational Psychology, New Orleans, LA.

Helmreich, R. L. (1987). Exploring flightcrew behavior. Social Behavior, 2, 63-72.

Hirschfeld, R. R. (1996). Evidence for the discriminant validity of conscientiousness and work orientation as principal components of global trait work motivation. (Doctoral dissertation, Auburn University, 1996).

Hogan, R. (1986). Hogan personality inventory manual. Minneapolis, NM: National Computer Systems.

Holland, J. L. (1966). A psychological classification scheme for vocations and major fields. Journal of Counseling and Psychology, 13, 278-288.

Hough, L. M. (1992). The "Big Five" personality variables—construct confusion: Description versus prediction. Human Performance, 5, 139-155.

Hunter, J. E., & Hunter, R. F. (1984). Validity and utility of alternative predictors of job performance. Psychological Bulletin, 96, 72-98.

Hurtz, G. M., & Donovan, J. J. (2000). Personality and job performance: The Big Five revisited. Journal of Applied Psychology, 85, 869-879.

Ilgen, D. R., Major, D. A., Hollenbeck, J. R., & Sego, D. J. (1993). Team research in the 1990s. In M. M. Chemers & R. Ayman (Eds.), Leadership theory and research: Perspectives and directions (pp. 245-270). San Diego, CA: Academic Press, Inc.

Izraeli, D. F. (1985). Sex differences in self-reported influency among union officers. Journal of Applied Psychology, 70, 148-156.

Jensen, A. R. (1998). The *g* factor. Westport, CT: Praeger.

Johnson, R. A., & Schulman, G. I. (1989). Gender-role composition and role entrapment in decision making groups. Gender & Society, 3, 355-372.

Jordan, M. J., Feild, H. S., & Armenakis, A. A. (2001). Team input and process variables: Their relationship to self-managing team performance in a field setting. Unpublished manuscript, Auburn University.

Judge, T. A., Higgins, C. A., Thoresen, C. J., & Barrick, M. R. (1999). The Big Five personality traits, general mental ability, and career success across the life span. Personnel Psychology, 52, 621-652.

Judge, T. A., Martocchio, J. J., & Thoresen, C. J. (1997). Five-factor model of personality and employee absence. Journal of Applied Psychology, 82, 745-755.

Kahan, J. P., Webb, N., Shavelson, R. J., & Stolzenberg, R. M. (1985). Individual characteristics and unit performance. Santa Monica, CA: Rand.

Kohli, A. K., Shervani, T. A., & Challagalla, G. N. (1998). Learning and performance orientation of salespeople: The role of supervisors. Journal of Marketing Research, 35, 263-274.

Langfred, C. W. (2000). Work-group design and autonomy: A field study of the interaction between task interdependence and group autonomy. Small Group Research, 31, 54-70.

LePine, J. A., Colquitt, J. A., & Erez, A. (2000). Adaptability to changing task contexts: Effects of general cognitive ability, conscientiousness, and openness to experience. Personnel Psychology, 53, 563-593.

LePine, J. A., Hollenbeck, J. R., Ilgen, D. R., & Hedlund, J. (1997). Effects of individual differences on the performance of hierarchical decision-making teams: Much more than g. Journal of Applied Psychology, 82, 803-811.

LePine, J. A., & Van Dyne, L. (1998). Predicting voice behavior in work groups. Journal of Applied Psychology, 83, 853-868.

Lester, S. W. (1991). The evolution of group potency: A longitudinal model of antecedents and consequences. (Doctoral dissertation, University of Richmond, 1997).

Levine, J. M., & Moreland, R. L. (1990). Progress in small group research. Annual review of psychology, 41, 585-634.

Lonergan, J. M., Long, H. J., Bolin, A., & Neuman, G. A. (2000). The Big Five, Task Type and Group Performance: A Meta-Analysis. Paper presented at the 15th annual meeting of the Society for Industrial and Organizational Psychology, New Orleans, LA.

Mann, R. D. (1959). A review of the relationships between personality and performance in small groups. Psychological Bulletin, 56, 241-270.

Martocchio, J. J., & Judge, T. A. (1997). Relationship between conscientiousness and learning in employee training: Mediating influences of self-deception and self-efficacy. Journal of Applied Psychology, 82, 764-773.

McCormick, E. J., Finn, R. H., & Scheips, C. D. (1957). Patterns of job requirements. Journal of Applied Psychology, 41, 358-364.

McCrae, R. R., & Costa, P. T., Jr. (1985). Updating Norman's "adequate taxonomy": Intelligence and personality dimensions in natural language and in questionnaires. Journal of Personality and Social Psychology, 49, 710-721.

McCrae, R. R., & Costa, P. T., Jr. (1987). Validation of the five-factor model of personality across instruments and observers. Journal of Personality and Social Psychology, 52, 81-90.

McGrath, J. E. (1964). Social psychology: A brief introduction. New York: Holt, Rinehart and Winston.

McGrath, J. E. (1984). Groups: Interaction and performance. Englewood Cliffs, NJ: Prentice-Hall.

McGrath, J. E., & Altman, I. (1966). Small group research: A synthesis and critique of the field. New York, NY: Holt.

Morgan, B. B., Coates, G. D., & Rebbin, T. J. (1970). The effects of Phlebotomus fever on sustained performance and muscular output (Interim Tech. Rep. No. ITR-70-14). Louisville, KY: University of Louisville.

Morgan, B. B., & Lassiter, D. L. (1992). Team composition and staffing. In R. W. Swezey and E. Salas (Eds.). Teams: Their training and performance (pp. 75-100). Norwood, NJ: Alex Publishing Corporation.

Mount, M. K., Barrick, M. R., & Stewart, G. L. (1998). Five factor model of personality and performance in jobs involving interpersonal interactions. Human Performance, 11, 145-165.

Mullen, B., & Baumeister, R. R. (1987). Group effects on self-attention and performance: Social loafing, social facilitation, and social impairment. In C. Hendrick (Ed.), Review of personality and social psychology (pp. 189-206). Newbury Park, CA: Sage.

Mullen, B., & Copper, C. (1994). The relation between group cohesiveness and performance: An integration. Psychological Bulletin, 115, 210-227.

Mullen, B., Johnson, D. A., & Drake, S. D. (1987). Organizational productivity as a function of group composition: A self-attention perspective. Journal of Social Psychology, 127, 143-150.

Munsey, C. (2001, March 26). Court of inquiry yet to hear from sub's former skipper. Navy Times, p. 8.

Neck, C. P., Connerley, M. L., & Manz, C. C. (1997). Toward a continuum of self-managing team development. Advances in interdisciplinary studies of work teams (Vol. 4, pp. 193-216). JAI Press.

Neuman, G. A., & Wright, J. (1999). Team effectiveness: Beyond skills and cognitive ability. Journal of Applied Psychology, 84, 376-389.

Neuman, G. A., Wagner, S. H., & Christiansen, N. D. (1999). The relationship between work-team personality composition and the job performance of teams. Group & Organization Management, 24, 28-45.

Nicholls, J. G., Cheung, P. C., Lauer, J., & Patashnick, M. (1989). Individual differnces in academic motivation: Perceived ability, goals, beliefs, and values. Learning and Individual Differences, 1, 63-84.

Nicholls, J. G., Patashnick, M., & Nolen, S. B. (1985). Adolescents' theory of education. Journal of Educational Psychology, 77, 683-692.

Nunnally, J. C. (1978). Psychometric theory. New York: McGraw-Hill.

Pearlman, K., Schmidt, F. L., & Hunter, J. E. (1980). Validity generalization results for tests used to predict job proficiency and training success in clerical employees. Journal of Applied Psychology, 65, 373-406.

Ridgeway, C. L. (1983). The dynamics of small groups. New York, NY: St. Martin's.

Robertson, I. T., Baron, H., Gibbons, P., MacIver, R., & Nyfield, G. (2000). Conscientiousness and managerial performance. Journal of Occupational and Organizational Psychology, 73, 171-180.

Roth, P. L., & Bobko, P. (2000). College grade point average as a personnel selection device: Ethnic group differences and potential adverse impact. Journal of Applied Psychology, 85, 399-406.

Salgado, J. F. (1997). The five factor model of personality and job performance in the European Community. Journal of Applied Psychology, 82, 30-43.

Sall, J., & Lehman, A. (1996). JMP: Start statistics. New York, NY: Duxbury Press.

Sayles, L. R. (1958). The behaviour of industrial work groups. New York, NY: Wiley.

Schneider, B., & Bowen, D. E. (1985). Employee and customer perceptions of service in banks: Replication and extension. Journal of Applied Psychology, 70, 423-433.

Seashore, S. E., Lawler, E. E., Mirvis, P. & Cammann, C. (1982). Observing and measuring organizational change: A guide to field practice. New York, NY: Wiley.

Seers, A. (1989). Team-member exchange quality: A new construct for role-making research. Organizational Behavior and Human Decision Processes, 43, 118-135.

Shaw, M. E. (1976). Group dynamics: The psychology of small group behavior. New York, NY: McGraw-Hill.

Shea, G. P., & Guzzo, R. A. (1987). Group effectiveness: What really matters? Sloan Management Review, 28, 25-31.

Simons, T., Pelled, L. H., & Smith, K. A. (1999). Making use of difference: Diversity, debate, and decision comprehensiveness in top management teams. Academy of Management Journal, 42, 662-673.

Simons, T. L., & Peterson, R. S. (2000). Task conflict and relationship conflict in top management teams: The pivotal role of intragroup trust. Journal of Applied Psychology, 85, 102-111.

Smith, K. G., Smith, K. A., Olian, J. D., & Sims, H. P. (1994). Top management team demography and process: The role of social integration and communication. Administrative Science Quarterly, 39, 412-440.

Sosik, J. J., Avolio, B. J., & Kahai, S. S. (1997). Effects of leadership style and anonymity on group potency and effectiveness in a group decision support system environment. Journal of Applied Psychology, 82, 89-103.

Steiner, I. D. (1972). Group process and productivity. New York, NY: Academic Press.

Stewart, G. L. (1999). Trait bandwidth and stages of job performance assessing differential effects for conscientiousness and its subtraits. Journal of Applied Psychology, 84, 959-968.

Stewart, G. L., & Carson, K. P. (1995). Personality dimensions and domains of service performance: A field investigation. Journal of Business and Psychology, 9, 365-378.

Stewart, G. L., Manz, C. C., & Sims, H. P., Jr. (1999). Team work and group dynamics. New York, NY: John Wiley & Sons, Inc.

Swezey, R. W., & Salas, E. (1992). Guidelines for use in team-training development. In R. W. Swezey & E. Salas (Eds.), Teams: Their training and performance (pp. 219-245). Norwood, NJ: Ablex Publishing Corporation.

Tesluk, P., & Gerstner, C. R. (2000). Results From a Field Study Linking Team Leadership, Processes, and Performance: Expanding Basic Input-Process-Outcome

Models. Paper presented at the 15th annual meeting of the Society for Industrial and Organizational Psychology, New Orleans, LA.

Tesluk, P., Mathieu, J. E., Zaccaro, S. J., & Marks, M. (1997). Task and aggregation issues in the analysis and assessment of team performance. In M. T. Brannick, E. Salas, & C. Prince (Eds.). Team performance assessment and measurement: Theory, methods, and applications (pp. 107-224). Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.

Tett, R. P., Jackson, D. N., & Rothstein, M. (1991). Personality measures as predictors of job performance: A meta-analytic review. Personnel Psychology, 44, 703-742.

Tziner, A., & Eden, D. (1985). Effects of crew composition on crew performance: Does the whole equal the sum of the parts? Journal of Applied Psychology, 70, 85-93.

VandeWalle, D. (1997). Development and validation of a work domain goal orientation instrument. Educational and Psychological Measurement, 57, 995-1015.

VandeWalle, D., Brown, S. P., Cron, W. L., & Slocum, J. W., Jr. (1999). The influence of goal orientation and self-regulation tactics on sales performance: A longitudinal field test. Journal of Applied Psychology, 84, 249-259.

Van Scotter, J. R., & Motowidlo, S. J. (1996). Interpersonal facilitation and job dedication as separate facets of contextual performance. Journal of Applied Psychology, 81, 525-531.

Wall, T. D., Kemp, N. J., Jackson, P. R., & Clegg, C. W. (1986). Outcomes of autonomous workgroups: A long-term field experiment. Academy of Management Journal, 29, 280-304.

Weaver, G. R., Trevino, L. K., & Cochran, P. L. (1999). Corporate ethics programs as control systems: Influences of executive commitment and environmental factors. Academy of Management Journal, 42, 41-57.

Williams, H. M., & Parker, S. K. (2000). Understanding Why Self-Managing Teams Can Have Positive Consequences: The Importance of Considering Mediators and Moderators. Paper presented at the 15th annual meeting of the Society for Industrial and Organizational Psychology, New Orleans, LA.

Zweig, D., & Webster, J. (2000). What Are We Measuring? Distinguishing Goal Orientation from Self-Efficacy and Personality. Paper presented at the 15th annual meeting of the Society for Industrial and Organizational Psychology, New Orleans, LA.

APPENDIX A

PARTICIPANT FIRST SURVEY (TIME 1)

SOS TEAM EFFECTIVENESS SURVEY
11 April 2001

DEMOGRAPHICS

Directions: Before responding to the demographic information, ***please put your SOS student number in the following space:***

SOS STUDENT NUMBER: _____

Example: Student Number: 01CA1103
(01C = Class #; A11 = Flight #; 03 = # within flight)

The following relate to background information. Please check the appropriate responses.

1. **What is your Flight Number (example--B26)?** _____

2. **What is your gender?** ___ Male ___ Female

3. **What is your current military status?** ___ Regular/Active Duty
   ___ Guard/Reserve
   ___ Civilian

4. **How long have you been in the military?** ____ Years

5. **What is your current military rating?** ___ Rated
   ___ Line Officer
   ___ Non-line Officer
   ___ Other

6. **How old are you?** ___ Years

7. **What is your highest level of degree held?** ___ Bachelor's Degree
   ___ Master's Degree
   ___ Doctorate

8. **What was your college undergraduate GPA (4.0 scale)?** ____ (Ex.: 2.9—round to nearest tenth)

DIRECTIONS: This survey contains statements about SOS, your flight, and your feelings in general. Please read each statement and answer based on your opinions and beliefs. **There are no right or wrong answers.** Circle (or X) the one response that best represents your opinion of that statement based on the provided scale.

Use the following 6-point scale to respond to the items.

1 = STRONGLY DISAGREE
2 = Disagree
3 = slightly disagree
4 = slightly agree
5 = Agree
6 = STRONGLY AGREE

Example:
I like to exercise. [1] [2] [3] (4) [5] [6]

		STRONGLY DISAGREE	Disagree	Slightly Disagree	Slightly Agree	Agree	STRONGLY AGREE
1.	My flight has confidence in itself.	[1]	[2]	[3]	[4]	[5]	[6]
2.	My flight believes it can become unusually good at producing high-quality work.	[1]	[2]	[3]	[4]	[5]	[6]
3.	My flight expects to be known as a high-performing flight.	[1]	[2]	[3]	[4]	[5]	[6]
4.	My flight feels it can solve any problem it encounters.	[1]	[2]	[3]	[4]	[5]	[6]
5.	My flight believes it can be very productive.	[1]	[2]	[3]	[4]	[5]	[6]
6.	My flight can get a lot done when it works hard.	[1]	[2]	[3]	[4]	[5]	[6]
7.	No task is too tough for my flight.	[1]	[2]	[3]	[4]	[5]	[6]
8.	I'm happiest at work when I perform tasks on which I know that I won't make any errors.	[1]	[2]	[3]	[4]	[5]	[6]
9.	The things I enjoy the most are the things I do the best.	[1]	[2]	[3]	[4]	[5]	[6]
10.	The opinions others have about how well I can do certain things are important to me.	[1]	[2]	[3]	[4]	[5]	[6]
11.	I prefer to do things that I can do well rather than things that I do poorly.	[1]	[2]	[3]	[4]	[5]	[6]
12.	I feel smart when I do something without making any mistakes.	[1]	[2]	[3]	[4]	[5]	[6]
13.	I like to be fairly confident that I can successfully perform a task before I attempt it.	[1]	[2]	[3]	[4]	[5]	[6]
14.	I like to work on tasks that I have done well on in the past.	[1]	[2]	[3]	[4]	[5]	[6]
15.	I feel smart when I can do something better than most other people.	[1]	[2]	[3]	[4]	[5]	[6]
16.	The opportunity to do challenging work is important to me.	[1]	[2]	[3]	[4]	[5]	[6]
17.	When I fail to complete a difficult task, I plan to try harder the next time I work on it.	[1]	[2]	[3]	[4]	[5]	[6]
18.	I prefer to work on tasks that force me to learn new things.	[1]	[2]	[3]	[4]	[5]	[6]
19.	The opportunity to learn new things is important to me.	[1]	[2]	[3]	[4]	[5]	[6]
20.	I do my best when I'm working on a fairly difficult task.	[1]	[2]	[3]	[4]	[5]	[6]
21.	I try hard to improve on my past performance.	[1]	[2]	[3]	[4]	[5]	[6]
22.	The opportunity to extend the range of my abilities is important to me.	[1]	[2]	[3]	[4]	[5]	[6]
23.	When I have difficulty solving a problem, I enjoy trying different approaches to see which one will work.	[1]	[2]	[3]	[4]	[5]	[6]

NOTE: CHANGE OF RESPONSE SCALE

NOTE: Use the following *5-point* scale. Mark the number that best represents your opinion.

1 = if you ***STRONGLY DISAGREE*** or the statement is definitely false.
2 = if you ***Disagree*** or the statement is mostly false.
3 = if you are ***neutral*** on the statement, you cannot decide, or the statement is about equally true and false.
4 = if you ***Agree*** or the statement is mostly true
5 = if you ***STRONGLY AGREE*** or the statement is definitely true.

		SD	D	N	A	SA
24.		[1]	[2]	[3]	[4]	[5]
25.		[1]	[2]	[3]	[4]	[5]
26.		[1]	[2]	[3]	[4]	[5]
27.		[1]	[2]	[3]	[4]	[5]
28.		[1]	[2]	[3]	[4]	[5]
29.		[1]	[2]	[3]	[4]	[5]
30.		[1]	[2]	[3]	[4]	[5]
31.		[1]	[2]	[3]	[4]	[5]
32.		[1]	[2]	[3]	[4]	[5]
33.		[1]	[2]	[3]	[4]	[5]
34.		[1]	[2]	[3]	[4]	[5]
35.		[1]	[2]	[3]	[4]	[5]
36.		[1]	[2]	[3]	[4]	[5]
37.		[1]	[2]	[3]	[4]	[5]
38.	The NEO Five Factor Inventory personality dimensions (conscientiousness, extraversion, emotional stability, openness to experience, and agreeableness) are copyrighted and are not reproduced here.	[1]	[2]	[3]	[4]	[5]
39.		[1]	[2]	[3]	[4]	[5]
40.		[1]	[2]	[3]	[4]	[5]
41.		[1]	[2]	[3]	[4]	[5]
42.		[1]	[2]	[3]	[4]	[5]
43.		[1]	[2]	[3]	[4]	[5]
44.		[1]	[2]	[3]	[4]	[5]
45.		[1]	[2]	[3]	[4]	[5]
46.		[1]	[2]	[3]	[4]	[5]
47.		[1]	[2]	[3]	[4]	[5]
48.		[1]	[2]	[3]	[4]	[5]
49.		[1]	[2]	[3]	[4]	[5]
50.		[1]	[2]	[3]	[4]	[5]
51.		[1]	[2]	[3]	[4]	[5]
52.		[1]	[2]	[3]	[4]	[5]
53.		[1]	[2]	[3]	[4]	[5]

Use the following *5-point* scale. Mark the number that best represents your opinion.

1 = if you ***STRONGLY DISAGREE*** or the statement is definitely false.
2 = if you ***Disagree*** or the statement is mostly false.
3 = if you are ***neutral*** on the statement, you cannot decide, or the statement is about equally true and false.
4 = if you ***Agree*** or the statement is mostly true
5 = if you ***STRONGLY AGREE*** or the statement is definitely true.

		SD	D	N	A	SA
54.		[1]	[2]	[3]	[4]	[5]
55.		[1]	[2]	[3]	[4]	[5]
56.		[1]	[2]	[3]	[4]	[5]
57.		[1]	[2]	[3]	[4]	[5]
58.		[1]	[2]	[3]	[4]	[5]
59.		[1]	[2]	[3]	[4]	[5]
60.		[1]	[2]	[3]	[4]	[5]
61.		[1]	[2]	[3]	[4]	[5]
62.		[1]	[2]	[3]	[4]	[5]
63.		[1]	[2]	[3]	[4]	[5]
64.	The NEO Five Factor Inventory personality dimensions (conscientiousness, extraversion, emotional stability, openness to experience, and agreeableness) are copyrighted and are not reproduced here.	[1]	[2]	[3]	[4]	[5]
65.		[1]	[2]	[3]	[4]	[5]
66.		[1]	[2]	[3]	[4]	[5]
67.		[1]	[2]	[3]	[4]	[5]
68.		[1]	[2]	[3]	[4]	[5]
69.		[1]	[2]	[3]	[4]	[5]
70.		[1]	[2]	[3]	[4]	[5]
71.		[1]	[2]	[3]	[4]	[5]
72.		[1]	[2]	[3]	[4]	[5]
73.		[1]	[2]	[3]	[4]	[5]
74.		[1]	[2]	[3]	[4]	[5]
75.		[1]	[2]	[3]	[4]	[5]
76.		[1]	[2]	[3]	[4]	[5]
77.		[1]	[2]	[3]	[4]	[5]
78.		[1]	[2]	[3]	[4]	[5]
79.		[1]	[2]	[3]	[4]	[5]
80.		[1]	[2]	[3]	[4]	[5]
81.		[1]	[2]	[3]	[4]	[5]
82.		[1]	[2]	[3]	[4]	[5]
83.		[1]	[2]	[3]	[4]	[5]

APPENDIX B

PARTICIPANT SECOND SURVEY (TIME 2)

SOS TEAM EFFECTIVENESS SURVEY II
MARCH 26, 2001

DEMOGRAPHICS

Directions: Before responding to the survey, ***please put your SOS student number in space below:***

SOS STUDENT NUMBER: _____
Example: Student Number: 01BF6203
(01B = Class #; F62 = Flight #; 03 = # within Flight)

1. **Flight Number:** _____
2. **Gender**: _____ Male _____ Female
3. **Rating**: _____ Rated
   _____ Line Officer
   _____ Non-Line Officer
   _____ Other
4. **Age**: _____
5. **Status**: _____ Regular/Active Duty
   _____ Guard/Reserve
   _____ Civilian
   _____ International Officer

SOS CLASS 01-B
TEAM EFFECTIVENESS SURVEY II

DIRECTIONS: This survey contains statements about SOS, your Flight, and your feelings in general. Please pay attention to each statement and answer each based on your opinions and beliefs. **There are no right or wrong answers.** Circle (or X) the one response that best represents your opinion of the statement based on the provided scale.

RESPOND BASED ON YOUR EXPERIENCES OVER THE PAST FIVE WEEKS!

Use the following 6-point scale to respond to the items.

1 = STRONGLY DISAGREE
2 = Disagree
3 = slightly disagree
4 = slightly agree
5 = Agree
6 = STRONGLY AGREE

		STRONGLY DISAGREE	Disagree	slightly disagree	slightly agree	Agree	STRONGLY AGREE
1.	My Flight members were hard to communicate with.	[1]	[2]	[3]	[4]	[5]	[6]
2.	The Flight had a strong sense of togetherness.	[1]	[2]	[3]	[4]	[5]	[6]
3.	The Flight members generally trusted one another.	[1]	[2]	[3]	[4]	[5]	[6]
4.	The Flight lacked team spirit.	[1]	[2]	[3]	[4]	[5]	[6]
5.	I frequently must coordinate my efforts with others in the flight.	[1]	[2]	[3]	[4]	[5]	[6]
6.	Jobs performed by flight members are related to one another.	[1]	[2]	[3]	[4]	[5]	[6]
7.	For the flight to perform well, members must communicate well.	[1]	[2]	[3]	[4]	[5]	[6]
8.	To achieve high performance it is important to rely on each other.	[1]	[2]	[3]	[4]	[5]	[6]
9.	I depended on my flight-mates for doing my flight job well.	[1]	[2]	[3]	[4]	[5]	[6]
10.	All in all, I was satisfied with my flight.	[1]	[2]	[3]	[4]	[5]	[6]
11.	In general, I didn't like my flight.	[1]	[2]	[3]	[4]	[5]	[6]
12.	In general, I liked being here.	[1]	[2]	[3]	[4]	[5]	[6]
13.	My Flight had confidence in itself.	[1]	[2]	[3]	[4]	[5]	[6]
14.	My Flight felt it could solve any problem it encountered.	[1]	[2]	[3]	[4]	[5]	[6]
15.	My Flight believed it could be very productive.	[1]	[2]	[3]	[4]	[5]	[6]
16.	My Flight could get a lot done when it worked hard.	[1]	[2]	[3]	[4]	[5]	[6]

DIRECTIONS: This survey contains statements about SOS, your Flight, and your feelings in general. Please pay attention to each statement and answer each based on your opinions and beliefs. **There are no right or wrong answers.** Circle (or X) the one response that best represents your opinion of the statement based on the provided scale.

17.	No task was too tough for my Flight.	[1]	[2]	[3]	[4]	[5]	[6]
18.	My Flight expected to be known as a high-performing Flight.	[1]	[2]	[3]	[4]	[5]	[6]
19.	My Flight believed it could become unusually good at generating excellent results.	[1]	[2]	[3]	[4]	[5]	[6]
20.	This Flight should continue to function as a team.	[1]	[2]	[3]	[4]	[5]	[6]
21.	This Flight is capable of working together as a unit.	[1]	[2]	[3]	[4]	[5]	[6]
22.	I want to remain a member of this Flight.	[1]	[2]	[3]	[4]	[5]	[6]
23.	I wish it were possible for the Flight to end now.	[1]	[2]	[3]	[4]	[5]	[6]
24.	If it were possible to move to another Flight at this time, I would.	[1]	[2]	[3]	[4]	[5]	[6]
25.	It makes a difference to me how this Flight turns out.	[1]	[2]	[3]	[4]	[5]	[6]
26.	I would like to work with members of my Flight on other projects.	[1]	[2]	[3]	[4]	[5]	[6]

THANK YOU FOR PARTICIPATING!
PLACE YOUR SURVEY IN THE BOX AS YOU EXIT THE AUDITORIUM.

APPENDIX C

COMMANDER SURVEY (TIME 2)

October 2, 2000

Flight Commanders,

Thank you for participating in this study! As a former "Red Pants" myself, I understand how busy you are in the last week of a class. I am currently a Ph.D. student at Auburn University and have been working with the Plans, Programs, and Evaluations Directorate (SOC/XP) and SOS to conduct a study that explores teams and team dynamics. The study examines relationships between several team characteristics and team outcomes. Results of the study will be submitted to SOC/XP for possible use in future courses.

The attached questionnaires look much more intimidating than they are. The first one (next three pages) measures a flight commander's subjective judgment of his flight's performance (5 questions) during the 5 weeks of the SOS class. The second one asks you to fill out a short set of questions on your flight that measures **team viability** (whether the team has the capacity to remain as a viable team in the future) and flight cohesion (4 questions). ***ASSUME YOUR FLIGHT COULD REMAIN TOGETHER AS A TEAM IN THE FUTURE FOR THESE 11 QUESTIONS.***

You should be able to complete the whole package in 5-10 minutes. Again, thanks in advance for participating. **Please return the package to Capt XXX when you are finished**. I can be reached at 409-2095, or lefty_jordan@msn.com if you have any questions.

MARK H. JORDAN, Lt Col, USAF
Department of Management
College of Business
Auburn University
Auburn, Alabama 36849

DIRECTIONS: This survey contains statements about organizational citizenship behaviors of members of your flight. Please carefully read each statement and respond with your opinion (with reference to the student above) as to how much you disagree or agree, based on the response scale below.

Use the following 6-point scale to respond to the items.

1 = STRONGLY DISAGREE
2 = Disagree
3 = slightly disagree
4 = slightly agree
5 = Agree
6 = STRONGLY AGREE

Example:	
I like to exercise.	1 2 3 (4) 5 6

FOR QUESTIONS 1-11, PLEASE ASSUME YOUR FLIGHT COULD REMAIN TOGETHER AS A TEAM

1.	This Flight should continue to function as a team.	[1]	[2]	[3]	[4]	[5]	[6]
2.	This Flight is capable of working together as a unit.	[1]	[2]	[3]	[4]	[5]	[6]
3.	I want to remain Flight Commander of this Flight.	[1]	[2]	[3]	[4]	[5]	[6]
4.	I wish it were possible for the Flight to end now.	[1]	[2]	[3]	[4]	[5]	[6]
5.	If it were possible to move to another Flight at this time, I would.	[1]	[2]	[3]	[4]	[5]	[6]
6.	It makes a difference to me how this Flight turns out.	[1]	[2]	[3]	[4]	[5]	[6]
7.	I would like to work with members of this Flight on other projects.	[1]	[2]	[3]	[4]	[5]	[6]
8.	Some Flight members were hard to communicate with.	[1]	[2]	[3]	[4]	[5]	[6]
9.	The Flight had a strong sense of togetherness.	[1]	[2]	[3]	[4]	[5]	[6]
10.	The Flight members generally trusted one another.	[1]	[2]	[3]	[4]	[5]	[6]
11.	The Flight lacked team spirit.	[1]	[2]	[3]	[4]	[5]	[6]

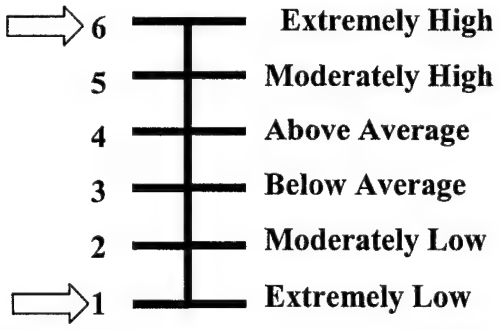
RATING OF FLIGHT PERFORMANCE QUESTIONNAIRE

DIRECTIONS: Below are 5 CHARACTERISTICS identified by Flight Commanders as dimensions they use to **subjectively judge Flight performance**. After each dimension (e.g., Level of Effort), there is a definition of the performance dimension followed by two examples that describe a Flight extremely high in performance on that dimension (=6) and a Flight with extremely low performance (=1) on that dimension. **THINK ABOUT YOUR FLIGHT'S PERFORMANCE DURING THE 5 WEEKS OF THE SOS CLASS.** Then, based on the description and the examples given for each performance dimension, rate your Flight's performance using the bar scale to the right of the examples. Write in the number (from 1 to 6) in the box below the examples/scale for each of the five dimensions that best describe your Flight's performance during the 5 weeks of the SOS class.

1. ***LEVEL OF EFFORT* in the Flight**: Amount of effort members of the Flight gave during all five weeks of the SOS class.

Example: Most or all Flight members tried very hard to succeed throughout all five weeks of the class, regardless of Flight standing.

Example: Many members of the Flight just "went through the motions" once it was clear goals could not be met.

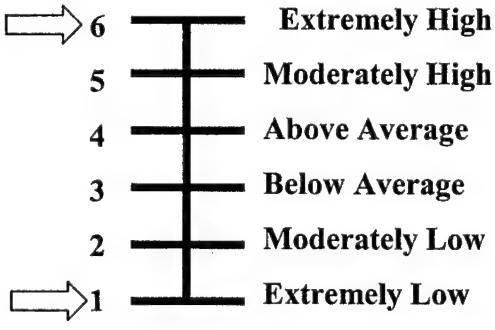


My Flight's *LEVEL OF EFFORT* rating is: _____

2. ***COMMITMENT* to the Flight**: Amount of sacrifice and selflessness of Flight members during all 5 weeks of SOS class.

Example: Most or many Flight members gave up some of their time to help weaker members improve in academics, writing, briefing, flickerball, etc..

Example: Many members looked out for themselves even though there were members in the Flight that could have used their help to improve Flight performance.

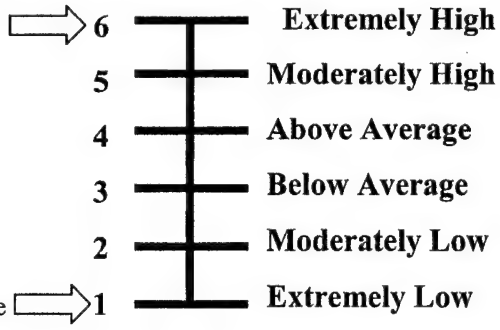


My Flight's *COMMITMENT TO THE FLIGHT* rating is: _____

3. ***INTERPERSONAL SKILLS* in Flight:** Interaction/communication between/among Flight members in different situations.

Example: All members of the Flight were allowed and encouraged to participate in planning sessions. The level of communication within the Flight was appropriate. All or most members interacted with one another in most situations.

Example: Many disagreements and arguments in planning sessions. Some members felt intimidated communicating and/or interacting with others in the Flight.

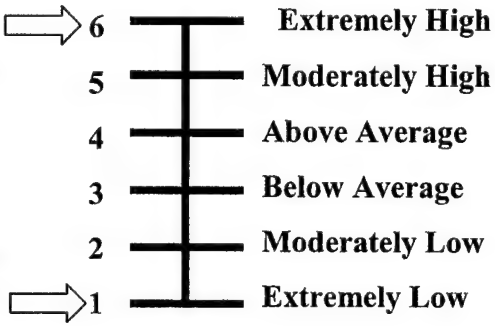


My Flight's *INTERPERSONAL SKILLS* rating is: _____

4. ***EFFECTIVE USE OF RESOURCES* by the Flight**: Flight used personnel, time, and material resources appropriately in all Flight tasks.

Example: Flight maximized use of time, used all material resources (e.g., project X materials) effectively, and used the Flight member's expertise appropriately in most or all situations.

Example: Flight wasted time, failed to consider material resources that might have helped them accomplish tasks, and did not defer to Flight members with the expertise in most or all situations.

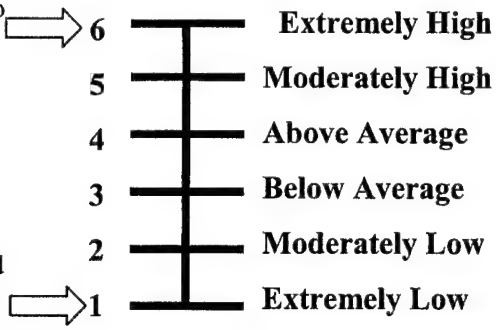


My Flight's effective *USE OF RESOURCES* rating: _____

5. ***OVERALL EVALUATION OF FLIGHT PERFORMANCE:*** Subjective assessment based on the four dimensions above and objective Flight performance (field campaigns, TLPs, Project X, Flight academic average, war game).

Example: Flight, for the most part, rated high to extremely high on the dimensions above, and finished high in the end of course Flight standings.

Example: Flight, for the most part, rated low to extremely low on the dimensions above, and did not finish very high in the end of course Flight standings.



My OVERALL EVALUATION OF FLIGHT'S PERFORMANCE: _____

PLEASE GO TO THE **TEAM VIABILITY**

SURVEY ON THE NEXT PAGE.

APPENDIX D

PARTICIPANT LETTER (TIME 1)

Auburn University

Auburn University, Alabama 36849-5241

Department of Management
415 W. Magnolia, Suite 401
Lowder Business Building

Telephone: (334) 844-4071

INFORMATION SHEET
FOR SQUADRON OFFICER SCHOOL
TEAM EFFECTIVENESS SURVEY

You are invited to participate in a study of Squadron Officer School to be conducted by Lt Col Mark H. Jordan, a Ph.D. student at Auburn University. I hope to learn about the many aspects of group dynamics and the relationship they have with group-level outcomes. You were selected as a possible participant because you are a student at Squadron Officer School and your opinion is valued.

If you decide to participate, the attached survey is for you to answer according to your own experience and opinion. Upon completion of the survey, please drop them in the box located at the entrance of the auditorium. The surveys will be collected and analyzed by Lt Col Jordan. It will take approximately 15 minutes to complete the survey.

This survey is intended to investigate the relationship between group-level individual difference variables and both group process and group effectiveness variables. The benefits of your participation include the opportunity to express your views and opinions about your flight during your time at Squadron Officer School.

Any information obtained in connection with this study will remain totally anonymous. Your student number will only be used to correlate responses from this survey and the follow-up survey in week 5 of the class. I plan to disclose the results of this research in summary report form to the policy, plans, and evaluation division at Squadron Officer College and write my dissertation to meet my research requirements at Auburn University. While your responses will form the basis of the summary report and dissertation, you will not be identified in any way and therefore will remain completely anonymous. I will not have access to your student identification numbers. You may choose not to participate in the research at any time.

Your decision whether or not to participate will not jeopardize your future relations with Squadron Officer College or Auburn University. If you have any questions, I invite you to contact me, Mark H. Jordan at 334-409-2095, at any time during the research process. I will be happy to answer any questions. For more information regarding your rights as a subject, you may contact the Office of Research Programs, Ms. Jeanna Sasser at 334-844-5966 or Dr. Steven Shapiro at 334-844-6499.

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER TO PARTICIPATE IN THIS RESEARCH PROJECT. IF YOU DECIDE TO PARTICIPATE, THE DATA YOU PROVIDE WILL SERVE AS YOUR AGREEMENT TO DO SO. THIS LETTER IS YOURS TO KEEP.

Dec 13, 2000

MARK H. JORDAN, Lt Col, USAF Date

HUMAN SUBJECTS
OFFICE OF RESEARCH
PROJECT #00-250EX0012
APPROVED 12/13/00 TO 12/12/01

DISSERTATION ABSTRACT

THE RELATIONSHIP OF INIDIVIDUAL DIFFERENCE AND GROUP PROCESS VARIABLES WITH SELF-MANAGED TEAM PERFORMANCE:

A FIELD INVESTIGATION

Mark H. Jordan

Doctor of Philosophy, December 15, 2001
(M.S., Troy State University Montgomery, 1988)
(B.A., Mississippi State University, 1981)

166 Typed Pages

Directed by Hubert S. Feild

The efficacy of dispositional individual difference team composition and group process variables in explaining team performance was examined for 1,030 military officers working in 92 teams over a 5-week period. The teams were assessed on both input variables (conscientiousness, extraversion, emotional stability, openness to experience, agreeableness, learning and performance goal orientation) and process variables (social cohesion and group potency). Team performance was measured with seven objective performance tasks (team leadership problem solving 1 and 2, computer simulation exercise, physical task exercise, and field operations performance 1, 2, and 3), and two subjective measures (team performance ratings and team member satisfaction). Of the input variables, only emotional stability and performance goal orientation showed

any predictive ability. Emotional stability predicted one of the objective criteria—computer simulation exercise. Moreover, performance goal orientation was negatively related to both team leadership problem solving 2 and field operations performance 1. Conscientiousness, extraversion, agreeableness, and learning goal orientation showed no relationship with hypothesized criteria. Of the group process variables, group potency exhibited the greatest predictive efficacy as it predicted unique variance in both subjective performance measures and 6 of the 7 objective performance measures over that of social cohesion. Social cohesion predicted unique variance in team member satisfaction over that of group potency. Additionally, social cohesion mediated the relationship between agreeableness and team member satisfaction. Implications, strengths, limitations, and directions for future study are discussed.